The Iron Age
A Chilton Publication
NATIONAL METALWORKING WEEKLY • DECEMBER 16, 1954

Your stake in your highways
See page 93

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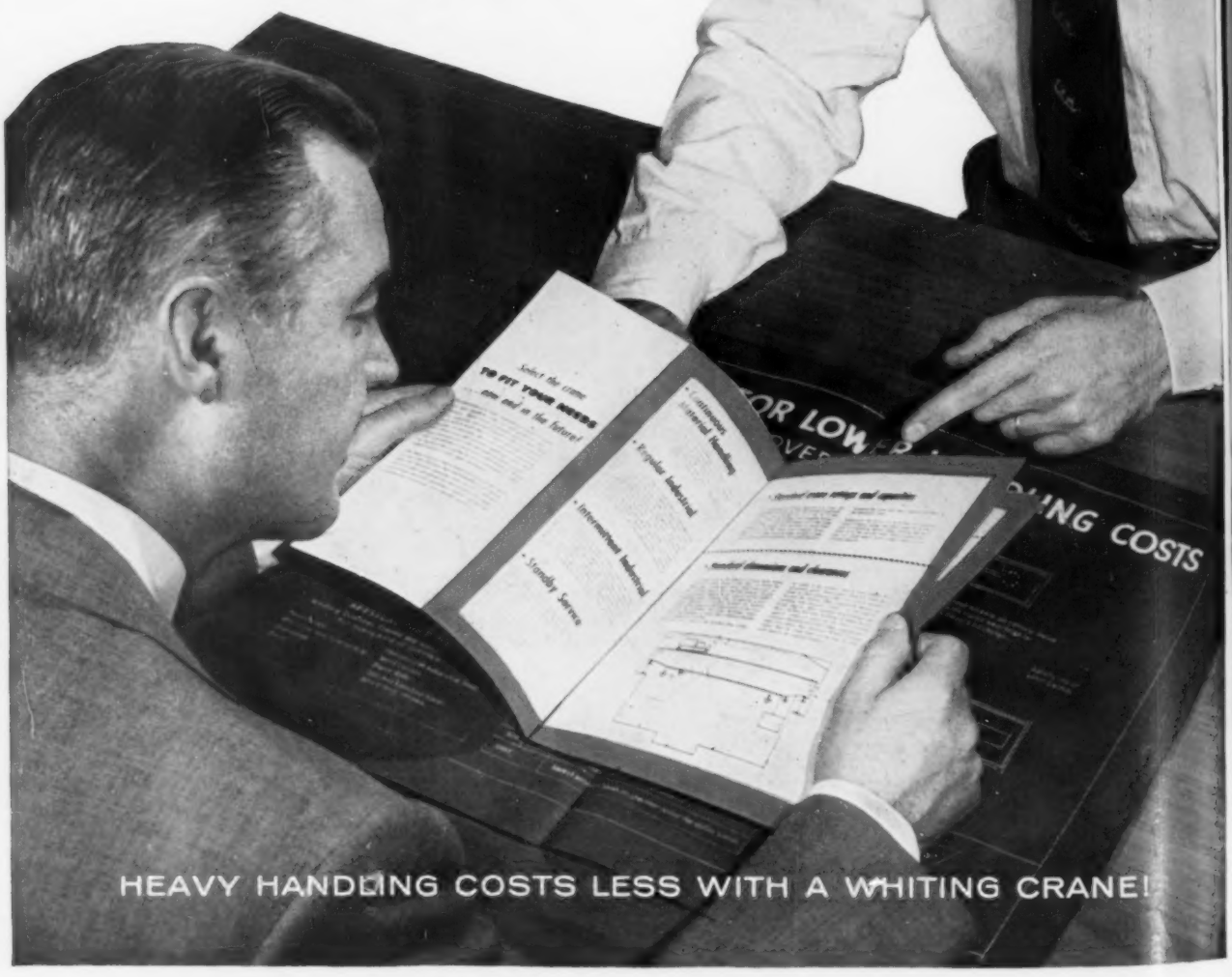
A partial list of contents reads as follows:

- The classes of crane service
- Standard crane ratings and capacities
- Standard dimensions and clearances
- Recommended speeds
- Motor ratings
- Cage or pendant operation
- How to choose the gear drive
- Structural framework recommendations
- Lubrication of gears and bearings
- 14 minimum safety features
- Erection and initial operation
- Sample form—How to request crane information
- Sample specifications

Write today for Bulletin Unit 79

WHITING CORPORATION

15601 Lathrop Avenue, Harvey, Illinois



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the Iron Age

Vol. 174, No. 25, December 16, 1954

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NEWS DEVELOPMENTS

ASK $50 BILLION TO BUILD U. S. ROADS — P. 71
Motor vehicle registrations have grown from 34.8 million in 1941 to 58.1 million this year. Mileage is up from 333.4 billion in 1951 to 557 billion today. Estimated loss in time, gasoline, wear and tear, inefficiency and accidents totals $3 billion per year. Administration will ask Congress for $50 billion in next 10 years for adequate highway program. This would be in addition to sums already planned for road building.

WISE TRAFFIC MANAGEMENT SAVES MONEY — P. 75
Manufacturers can save as much as 15 pct of freight costs by combining small pickups or deliveries to take advantage of truckload rates. Three extra stops are allowed. Savings can raise profit margin.

MATHEMATICAL SCHEDULING SYSTEM PAYS OFF—P. 76
More firms are saving money, boosting production and raising profits with mathematical programming. Use method on production scheduling for achieving top production, lowest costs, highest profit or variety of other objectives. It can be applied to paperwork, inventories, subcontracting. Consulting firm offers training program for industry men.

INCENTIVES CAN PROTECT YOUR ESTATE — P. 78
If your business is to continue to benefit your heirs after your death, it is obviously essential that it be well run. Important as your key employees are now, they will be even more important to your heirs. Adequate protection for these men, designed to give appropriate financial reward with a minimum of tax penalties to both firm and employees, is an important part of sound estate planning.

CHRYSLER OUTPUT RATE KEEPS CLIMBING — P. 88
Auto production of the Chrysler Corp. now tops the firm's goal of 20 pct of the market. This is one salient feature of automotive statistics as the year nears its end. Others: The industry produced its 5 millionth passenger car last week.

WORKMEN'S COMPENSATION COSTS MAY RISE — P. 93
Industry's cost for workmen's compensation may be headed up as a result of Labor Dept. efforts to evade the "anti-labor" tag applied to it during the campaign. The department is drafting a new "model" compensation act which it will urge state legislatures to follow. Model would increase industry responsibility.

DIGEST OF THE WEEK

ENGINEERING & PRODUCTION

SURFACE TREATMENTS IMPROVE ALUMINUM — P. 111
There are literally scores of methods and materials for treating aluminum surfaces. They range from mechanical treatments as polishing, scratch-brushing and sandblasting to chemical and electrolytic treatments for a number of unique finishes. Anodizing, for example, not only improves corrosion and abrasion resistance, but provides a good base for paint and insulates surfaces of parts used as electrical conductors.

MATCH INDUCTION HEATING TO THE JOB — P. 115
Chrysler uses many types of induction hardening machines for faster, more efficient processing. Some are special purpose types, others may be magazine fed, fully automatic or hand fed. But each produces exact hardness in a specified part area. Ingenious fixtures speed output without any quality sacrifice.

AUTOMATIC WELDING SPEEDS TANK OUTPUT — P. 118
Coordinating automatic welding with good materials handling allows only 29 men to produce 20 500-gal and 1000-gal LPG tanks per 8-hour day. Shop layout is compact for a high work to space ratio.

STATISTICAL STUDY HELPS PART DESIGNER — P. 120
Statistics applied to metal properties can guide the part designer, may give him wider latitude. Use of "averages" or even incomplete knowledge of material properties has often resulted in "conservative" design. Statistics are applied here to Stellite 31.

FABRICATION OF ZIRCONIUM AND BERYLLIUM—P. 123
Processing zirconium and beryllium parts by powder metallurgy may offer a solution to conventional fabrication problems. Zirconium achieves full density at relatively low temperatures. Beryllium, even at near-melting temperatures is not completely dense.

MARKETS & PRICES

STRUCTURAL UNDERFLOORING MAKES GAINS — P. 74
More producers enter structural underflooring field as building booms, market grows. Started in 1937, first big gains were scored after World War II when sheet steel supply eased. Contractors like them for above-ground work in multi-story buildings. They'll be used in Chicago's new Prudential Building.

U. S. MANGANESE SUPPLIES TRENDING UP — P. 80
Manganese supply situation has eased considerably during 1954. Government incentives are bolstering domestic production, while imports, although below the all-time records of 1953, have been substantially above consumption. This is due largely to a decline in manganese use which ran parallel to the decline in steel production. Despite the government program the domestic U. S. supply, however, is still under 10 pct of needs. Now under test are low grade ore and slag recovery processes.

NEW STEEL ORDERS OUTSPEEDING PRODUCTION—P. 165
Steel orders continue to pour in faster than mills are rolling out the finished steel. Result is that order backlogs are growing and deliveries are becoming more extended. Most steel buyers freely admit they are placing orders for more tonnage than at any time in months. First half of '55 looks good.

STAINLESS AND ALLOY PRICES INCREASED — P. 166
The 4½¢-per-lb advance in nickel prices forced the stainless and alloy producers to up prices 2 pct on stainless. Alloy extras up 1 pct.

ALUMINUM OUTPUT MAINTAINS HIGH PACE — P. 172
Primary aluminum production in November totaled 121,252 net tons, about the same daily average as during the previous month. And most October shipments showed an increase. Meanwhile, zinc smelter stocks took another healthy dive in November.

NEXT WEEK:

VIBRATION TESTS HELP MACHINE TOOL EFFICIENCY
Vibration instruments can be used to increase output as well as for maintenance and trouble shooting. Inexpensive and easy to use, they take the guesswork out of detecting and measuring every day machine tool vibration. They have solved milling, turning and grinding problems in precision part production.

HOW DUPONT CUTS DRUDGERY AND BOOSTS OUTPUT
Photographic techniques are a powerful ally of duPont time study engineers in their battle to reduce or eliminate waste motion. By attaching lights to a worker's wrists, the photographer gets an accurate trace of all movement during a time exposure. Then and now comparisons prove system's value.

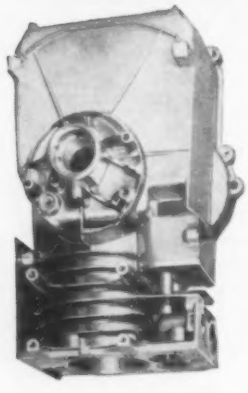
AJAX INDUCTION FURNACES

BRIGGS & STRATTON CORPORATION

1,000,000 INDUSTRIAL ENGINES

4 CYCLE BRIGGS & STRATTON GASOLINE ENGINES

With holding furnaces of 20 kW similar to that in the photo above, and melting furnaces of 100 kW, Briggs & Stratton Corp., Milwaukee, Wisc., is getting increased production under cleaner, more satisfactory working conditions than ever before, *and at lower operating* costs.



The intricate die-cast aluminum cylinder shown at the left is one of many produced at the B & S plant from high grade aluminum alloy melted in low-frequency AJAX induction furnaces. In these furnaces *only the metal is heated.* Energy is transmitted to the molten charge without actual contact through the refractory walls. There are no resistors or other parts having a higher temperature than is absolutely necessary for properly melting the charge. Over-heating is avoided, and there is practically no oxidization.

The holding furnaces next to the die-casting machines as well as the melting furnaces are automatically controlled at a temperature within ±5° F., holding the metal at the lowest feasible casting temperature. The agitation due to internal electrical stirring in the metal gives the best conditions for holding furnaces, and there is little possibility of sludge formation at the bottom, because this is where the heat is generated.

Write for Further Information to

AJAX ENGINEERING CORP., TRENTON 7, N. J.

AJAX TAMA-WYATT

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AJAX ELECTRO METALLURGICAL CORP., and Associated Companies
AJAX ELECTROTHERMIC CORP., Ajax Northrup High Frequency Induction Furnaces
AJAX ELECTRIC CO., INC., The Ajax Hultgren Electric Salt Bath Furnace
AJAX ELECTRIC FURNACE CORP., Ajax Wyatt Induction Furnaces for Melting

dear editor: *letters from readers*

Memo from Washington

Sir:

Many years ago when I was trying to work out the intricate aspects of malleable iron and open-hearth and electric steel, I read your good magazine religiously.

In recent years it has not been possible, but may I just drop you a note on the magnificent editorials you have been running with respect to the position of the United States in the world of today.

They could not be better and I congratulate you. *Stuart Symington, United States Senate.*

Letter to the Publisher

Sir:

I have, for many years, read and enjoyed THE IRON AGE. The outstanding feature, in my book, has always been the excellent editorials by Tom Campbell. I have many times felt that it is unfortunate such thought provoking writings do not reach more people than primarily those who read trade journals such as IRON AGE.

The most recent one, "Shouldn't the People Be Told," is an excellent example of an editorial which should be spread as far and as wide in this country as is humanly possible. I suggest to you as a publisher that every effort be made to do this. You should know the ways and means of doing this—it's your business—I'm simply an engineer and would not know just how to go about it.

The situation which Tom writes about is reminiscent of 1939 when our great politicos in Washington wouldn't tell the people the score, and as a result of false economy we were training our draftees with brooms and wooden guns. The training wasn't serious either since no one would announce what the score really was. We were "protecting" the people from the cold facts of life because they couldn't take it. This protection was purely political expediency and so much "bilge water." The people proved it in World War II, and the English people proved it even more so than we did because it was more necessary in their case. The people can take it!! *W. L. Besselman, Engineering Dept., Leeds & Northrup Co., Philadelphia.*

We feel, sometimes, as you do: that the editorials should have an even wider audience than the 150,000 executives reached by THE IRON AGE.

321 and 347 Stainless

Sir:

We have your IRON AGE issue of Nov. 25 and are interested in securing a few extra tear sheets of the article entitled "Proper Treatment for Preserving Properties of Type 321 and 347 Stainless" by Hiram Brown.

It would be appreciated very much if you could send us about six of these tear sheets. *R. H. Shoemaker, Vice-President, Kolene Corp., Detroit.*

New Stainless Alloy

Sir:

In the Dec. 2 issue of THE IRON AGE appears the article "New Stainless Alloy Bridges Gap Between 300 and 400 Series" pp. 113-116.

We would very much appreciate receiving your permission to reprint for distribution to our members only. Proper credit would, of course, be given. *J. R. Derrickson, Executive Secretary, Formed Steel Tube Institute, Cleveland.*

Cutting Oil

Sir:

If possible, will you please mail us five tear sheets of the article on p. 102 entitled "Cutting Oil: Survey Industry Use," from your Nov. 18 issue? *H. P. Berington, Wheelock, Lovejoy & Co., Inc., Chicago.*

What does "S.B." mean to you?

To some, it means Salad Bowl and a French chef concocting a tasty dish. But, to hundreds of industrial designers, it means Small Balls... the precisioneered kind Universal makes so accurately for smooth operation.

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7 to 12 times faster

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HARDENING . . . ASSURES UNIFORM HARDNESS

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fatigue cracks

by William M. Coffey

Puzzlers

We're a little behind on reporting puzzler solutions and winners. So with your kind permission let's bring them all up to date. We wouldn't want to spoil anyone's Christmas.

November 4 puzzler, about the paw, the grandpaw and the sonpaw. The sonpaw is 13.3333 years of age, the paw is 33.3333 and the grandpaw is 53.3333. Winners: James M. Talbot, Ole Ridge, E. Pojen, Jim Mull and Marilyn, David W. Sampson, John P. Cochran, George W. Frederick, Bud Wyser, Wm. E. McCord, Fred P. Boulais, Willard S. Mott, Morton M. Schaffer, C. W. McKinley, Marion Morski, Dave Jaffe, E. W. Stanley, A. E. Sather, Bob Bronson, P. B. Vaughan, G. Stanley Sangdahl, George Griffin and Charley Dexter. This puzzler was submitted by Charlsie Burch, secretary to the General Steel Castings Corp. IRON AGE Puzzle Club. We understand that we have to call Charlsie Mrs. Walter G. Vunovic now as she has just taken the step. We congratulate Mr. Vunovic and send Charlsie our very best.

Charlsie Becomes Bride

. . . the former Miss Burch wore a floor-length gown of white tulle over satin fashioned with a fitted bodice and short sleeves. Rows of ruffled princess lace outlined the bateau neckline and trimmed the sleeves and the bouffant skirt was held wide with hoops. Tulle mitts completed the bride's costume and she carried a cascade bouquet of white chrysanthemums and snowflake pompons in the left hand and a copy of THE IRON AGE, opened to Fatigue Cracks, in the right hand.

November 11 puzzler, about the petrified doughnut and the cup of coffee. The diameter of the cup mouth or bagel is 3.651483 inches. Winners: Mrs. Walter G. Vunovic and her puzzle club with Dale Letterman, C. W. McKinley, Alfred M. Gladstone, Lee Fields, William Murray and C. K. Harris.

November 18 puzzler, about the two girls holding a jumping rope. The final distance between the girls would be 5.26 ft. Winners: C. W. McKinley.

November 25 puzzler, about the cube that is painted green. The shape is hexagon and the length of one side is $\frac{1}{2}\sqrt{2}$. Winners: Ira B. Blumenthal and Captain R. H. Lambert, USN. Where was Mrs. Vunovic on this one?

New Puzzler

O Civilie, si erco
Fortibusus in ero
O Nobilie deis trux
Votis Enem? Causans dux

This comes from "the worst metallurgist east of the Mississippi." You are supposed to get some sense out of it. And when you do you'll understand why the donor remains anonymous.

New New Puzzler

Given: Letter "O" equals zero: Letters "D" and "E" represent consecutive numbers. Find all the numbers. Many thanks to Mr. O. L. Hurlt for a Hard puzzler.

```
                P U Z Z L E
H A R D | A U D U D E A E O
        P L L P
          D Z P D
          E E U U
          H A R P E
          H P U L U
            H A E H A
            H P U L U
              H O A Z E
                Z L O P
                  D Z A O
                  D Z A O
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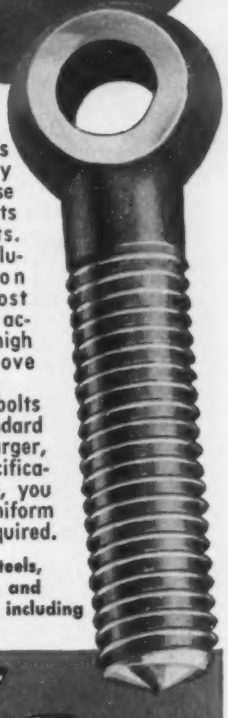
Threaded Specialties

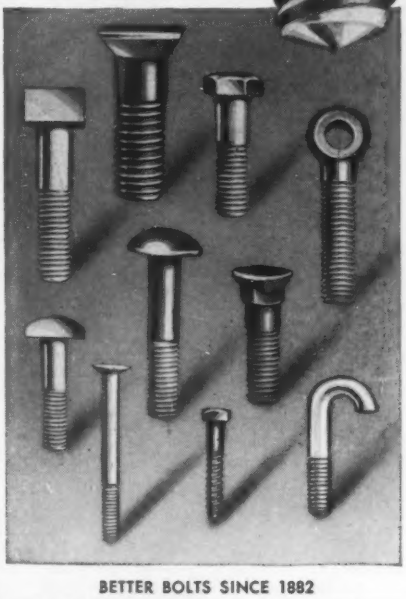
lower cost
EYE BOLTS
by an
exclusive method



Among Pawtucket's many specialty products are these lower-cost eye bolts or "swing" bolts. Pawtucket's exclusive production method keeps cost low, dimensional accuracy unusually high and strength above standard.

Pawtucket eye bolts are made in standard sizes ¼" and larger, or to your specifications. In any size, you can depend on uniform Class 3 fit, if required.

All standard steels, stainless steels and non-ferrous metals, including Titanium



BETTER BOLTS SINCE 1882

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"The Bolt Man"

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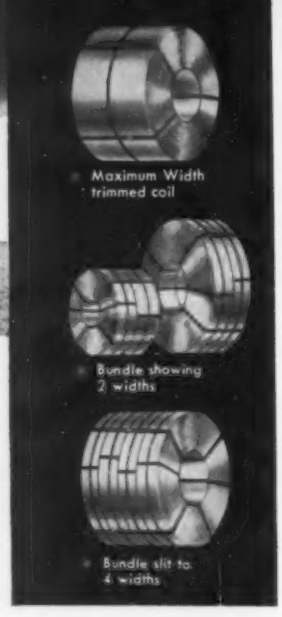
CONTINUOUS MILL

PLATE • SHEET • STRIP—*available in hot rolled quality*



The quality of Alan Wood Steel is of prime importance to both our customers and ourselves. Our Continuous Mill produces steel from .059″ to .500″ to a maximum width 25½ inches, furnished in coils or cut lengths as required. Rigid metallurgical control means that you get *what you want!* Years of steel making experience plus our mine-to-mill undivided responsibility assures you the best quality steel possible to produce.

Because we're located in the heart of the East's great industrial and transportation area, we can often make faster delivery.

More than a century and a quarter of iron and steel making experience.

ALAN WOOD STEEL COMPANY

CONSHOHOCKEN, PA.

The Iron Age Newsfront

Railroad Buying: Brighter for '55

Recent upturn in steel production could be the shot in the arm needed to stimulate railroad buying of steel in '55. Reason: Higher production means more rail movement of ore, coke, scrap. Lack of railroad buying has been keenly felt. Short term outlook is better on rails and track supplies than it is for freight cars.

Business Swings High In England, Too

Recent upward swing in business conditions in U. S. has been matched in the United Kingdom. October industrial output hit new records, with steel, engineering and shipbuilding leading the way. Substantial increases in applications for permits for factory buildings, and in orders for machine tools and other capital goods have been noted.

How Healthy Is Your Top Staff?

A clinical report on 500 business executives examined under hospital conditions shows: 41 pct needed medical attention; 11 pct had ailments and knew about them; 25 pct had minor abnormalities. Average age of men examined: 48 years.

Magnesium: Lighter Luggage for Flying

A new aircraft luggage made from magnesium will soon be marketed. The lightweight luggage is especially designed for the air traveler.

Tubing Produced From Ductile Iron

Extruded ductile iron tubing is now being used in an acid handling application. At least one company is experimentally cold drawing small diameter tubing from ductile iron.

Tooling: $¾ Billion for '55 Models

Automakers spent a record $¾ billion in tooling for the 1955 models. The changeovers were the most significant in automotive history and the result was the largest tooling bill. This figure does not include the cost of new plants or similar capital improvements.

Titanium Centrifugal Castings Poured

Difficulties encountered in melting and pouring titanium, a stumbling block in some applications of the metal, are reported to have been overcome. True centrifugal castings of titanium have recently been successfully produced.

Silicate Coating: Paint On and Fire

A silicate coating material, similar to porcelain enamel, which will fuse to metal at temperatures of from 900° to 1200°, has been developed. The coating is applied in the form of a paintlike liquid. Water is evaporated and the object fired. Basic ingredient is a sand from northern Michigan.

Metal Pump: Diecasters Take Note

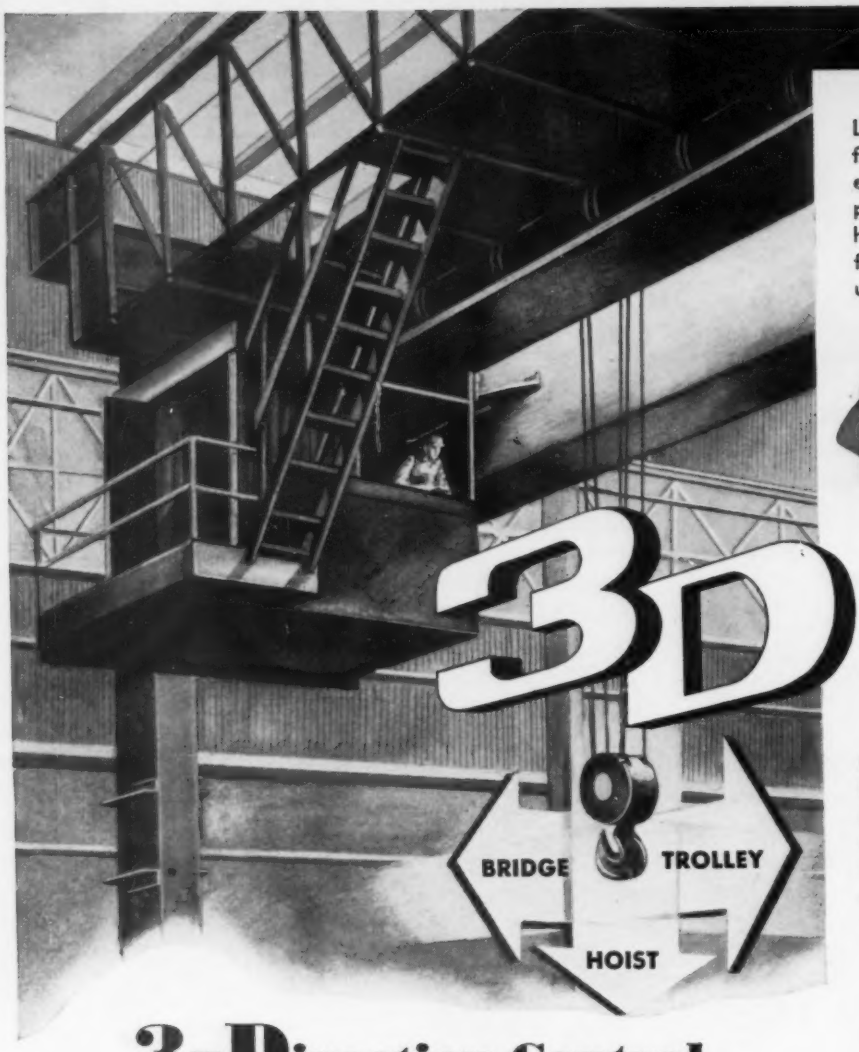
A pump, operating on an electromagnetic principle and used to move liquid metals in cooling and heating systems, may prove effective in forcing liquid metal into forms in diecasting operations. An electric current is passed through the metal in a direction perpendicular to a magnetic field which surrounds the metal. This established a force which sets the metal in motion within the pumping section.

There's a Market for Small Welding Units

Recent hurricanes and other emergencies with power interruptions have given an unexpected push to the market for small self-powered welding machines equipped with electric power take-offs as auxiliary power source.

Rare Earths: Methods Evaluated

Improved methods of making rare earth additions, either in oxide form or as misch metal, are causing some speculation as to which is the better means. Users are finding that too great an addition is more detrimental than not enough. Canned oxides which submerge before melting are being used to obtain better mixture with the bath. Others prefer metallic rare earths mixed with modifiers for less costly addition and more effective use of properties.



3-Direction Control for Cranes is Our Specialty

For more than half a century, EC&M has led in the development of sturdy, highly efficient electrical equipment for cranes.

Designed into this equipment is that extra margin of safety and quality which insures uninterrupted service to the user . . . which also includes features helpful to maintenance men and operators, aiding them in their daily tasks.

Users recognize the symbol, (E&M) as a standard of value and specify this equipment whenever new cranes are purchased or when revamping existing installations. These users know that control, only a small part of the initial cost, is a vital part of every crane.

It pays to standardize on EC&M Control for cranes.

WRITE TODAY FOR BOOKLET 921

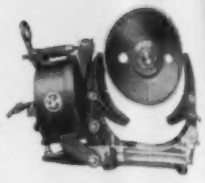
FOR A COMPLETE LINE OF CRANE CONTROL SPECIFY EC&M

THE ELECTRIC CONTROLLER & MFG. CO.

2698 EAST 79th ST. • CLEVELAND 4, OHIO

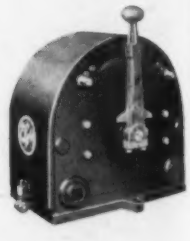
3779

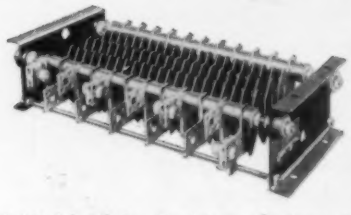
Long-Life Brakes for cranes operated by a-c or d-c power . . . give high speed performance with low upkeep.



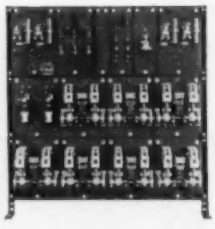
Youngstown Safety Limit Stops protect against overhoisting accidents . . . a positive check against human errors.

Cam-Type Master Switches have narrow width and short throw . . . less fatigue for the operator.



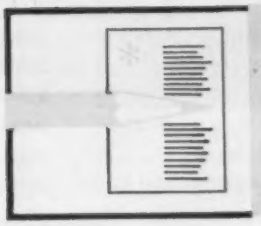


Tab-Weld Plate Resistors feature spot-welding that provides a continuous path and keeps resistance value constant.



Reversing - Plugging Control for bridge and trolley motions . . . automatically controlled acceleration and only one adjustable relay for plugging.

Manual - Magnetic Disconnect Switches operate with ease . . . are arranged to control crane lights also.



NEWS SECTION
SPECIAL REPORT

Ask $50 Billion To Build U. S. Roads

Vehicle miles have jumped from 333.4 to 557 billion since 1951 . . . Jammed, unsafe highways cost U.S. $3 billion per year in time, gas, damage . . . Propose 40,000 miles of turnpike, we have 1143—*By R. D. Raddant.*

◆ HIGH IN importance among President Eisenhower's recommendations to Congress next month will be a multi-billion dollar program to bring the nation's highways up to standard.

It is of vital interest to individuals, businesses, industries and the government because the sad state of our highways is costing the nation an estimated $3 billion a year.

And each year highways are permitted to lag further behind the nation's needs, the cost of eliminating this expense increases. This is the reason for the urgency of the program.

Any projection of a long-term program that might result in a 10-year expenditure of $50 billion over the current rate of highway spending breaks down into two different segments. One is the need of the highway improvement program. Second is what the program itself will involve in expenditures for materials, labor and equipment.

The basic need for better highways is illustrated by a few simple figures. In 1951 annual vehicle-miles totaled 333.4 billion. This year the same figure will reach 557 billion. It is estimated by the Bureau of Public Roads that by 1965 the figure will hit 814 billion miles.

At the same time motor vehicle registrations have jumped from 34.8 million in 1941 to an estimated 58.1 million at the end of 1954. Registrations should reach nearly 80 million by 1965.

But, highway expenditures are not keeping pace. As a result, highways are not only inadequate, but are lagging more and more behind requirements.

State highway officials in 1949 estimated that it would take a $25 billion program to bring the nation's highways up to standard. In 1951 the estimate was upped to $32 billion and in 1953 to $35 billion, despite the billions that had been spent in the meantime.

Latest findings of the Bureau of Public Roads indicate that highway needs by 1964 will require an expenditure of $54 billion more than will be spent if highway outlays continue at current rates. This estimate is the basis of the so-called $50 billion program.

Our inadequate road system is costing your firm and you as an individual a lot of money every day. Poor roads mean lost time, extra costs in transportation of materials and supplies, expensive and tragic accidents, higher insurance rates, depreciation of property, lost markets and the many untotaled penalties of congestion.

Another angle: there already is evidence that in a few areas the

What the 10-Year Road Program Means to Industry . . .

The optimum 10-year program to bring the nation's highways up to a level that would be adequate for 1974 traffic levels would require an increase of $5 billion a year over current highway expenditures. This is what the $5 billion would buy in materials and labor:

Rights of way, engineering materials and supplies	$1,000 million
Sand, gravel, crushed rock	280 million
Cement	180 million
Asphalt, tar, road oils	140 million
Ready mix concrete	95 million
Bituminous paving material	90 million
Concrete culvert pipe	65 million
Metal culvert pipe	45 million
Structural steel	210 million
Reinforcing steel	110 million

Lumber	50 million
Timber piling	10 million
Explosives	20 million
Clay pipe	5 million
Petroleum products	140 million
Other materials	80 million
TOTAL MATERIALS & SUPPLIES	$1,520 million
Contractors' on-site labor	1,080 million
Contractors' equipment, expense, miscellaneous overhead and profit	1,400 million

automobile market has reached the saturation point. Where this results, the market for automobiles is relegated to replacement rather is one reason the auto industry than expansion. This, of course, has the biggest, and most obvious, stake in the highway program.

Recent construction of turnpikes and freeways has provided an opportunity for studies of the savings that can be attributed directly to highways, both metropolitan and intercity. Here are some of the findings of the Bureau of Public Roads:

Saved $3 Million

"A 14-mile section of Edens Expressway extending north of Chicago was opened to traffic this year. Replacing the old Skokie route, this 6-lane divided highway, constructed to interstate highway standards including full control of access, not only eliminated congestion and reduced the high accident rate formerly experienced on U. S. 41, but also reduced the average travel time by about 17 minutes. Completed at a cost of $22 million, this modern facility has been estimated to save motorists over $3 million annually in terms of accidents, time, tires and gasoline."

"Houston (in 1950) has completed 4.3 miles of freeway and 1 mile of what is called a 4-street operation. The results reported by the state for 20 months of operation are striking. Traffic has grown from 28,000 vehicles per day to 63,300. Time saved by drivers amounts to nearly 3 million hours. Money saving is estimated at $4.7 million, or more than enough to pay for 2 miles of expressway, exclusive of right-of-way."

Studies of Los Angeles freeways indicate a savings of 2¢ per vehicle mile.

The New York Truck Assn. found that in 1950 the average truck in midtown Manhattan was losing 4 hours of earning time daily. Total cost of this loss for all the trucks in the city amounted to $150 million that year.

A Citizen's Traffic Safety Board of New York estimates that increased meter charges and tips for taxicab travel came to $57 million per year.

A study of the Maine Turnpike and U. S. 1 which runs parallel to it, showed that higher speeds on the turnpike increased fuel consumption, but this was offset by reduced starting and stopping costs. Driving time on the turnpike was less than 1 hour, while for U. S. 1 it took between 1½ and 2 hours.

The Pennsylvania Turnpike and an alternate route showed time savings from 1¼ hours for light trucks to 4½ on heavy trucks. Fuel savings were often $20 or twice toll costs.

Cut Accident Rate

Accidents per vehicle-miles have shown excellent improvement where comparative studies have been made, although higher speeds have contributed to seriousness.

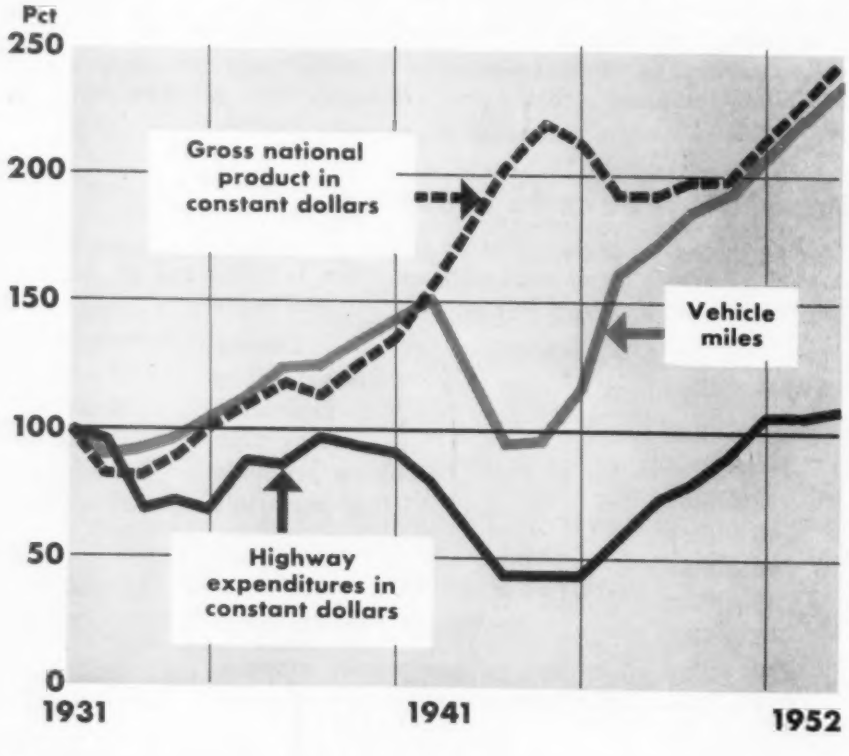
There is another factor in improved highways which is particularly significant to business and industry. Limited access highways have shown themselves to be valuable assets to industrial property. In Buffalo, after plans for the thruway route were firmed, the Chamber of Commerce succeeded in interesting firms in locating near it, and these companies have invested or plan to invest more than $25 million in construction. A similar development followed construction of a circumferential route around Boston.

Names Committee

To help in formulating the Administration's highway program, the President appointed a highway advisory committee headed by Gen. Lucius D. Clay. This committee has acted as a clearing house of highway material and will make its recommendation to the President who will in turn make his recommendations to Congress.

Undoubtedly, the committee's emphasis will be on the interstate highway system, although it should be emphasized that there is no Clay Committee report as yet. Nor has the President indicated anything more definite than he believes we need a $50 billion program.

Traffic Outstrips Highway Expenditures



Bureau of Public Roads reported to the Clay Committee that it would take an estimated $54,565,000,000 over current highway spending rates (which over a 10 year period would amount to $46.8 billion) to create an adequate highway system by 1965. This is not a program, however, only an estimate.

Build Interstate System

The interstate system would probably require a total of $24 billion itself with other rural and state roads taking another $77 billion. If current highway spending were projected 10 years, it would amount to about $46.8 billion. This means the difference of $54.6 billion would have to be raised through whatever program Congress passes. There is no guarantee that the Clay Committee will recommend the full $101 billion program or that Congress would be inclined to favor a program that large.

40,000-Mile Expressway

The interstate system consists of 40,000 miles of highways connecting all major population centers. It would carry 30 pct of all rural traffic, 20 pct of all urban traffic, and would handle 25 pct of all vehicle miles of traffic on a little over 1 pct of the mileage. It would cover all urban expressways in urban systems plus main highways. Half the total motor vehicles would use the system every day.

Most of the features listed above would come directly from completion of the interstate system. It is significant from the national defense point of view, not only from the concept of transportation of men and materials, but from evacuation of metropolitan areas.

This system would include most of the existing or authorized turnpikes, which will create a financial problem should a major part of the program be financed by the Federal Government, as now seems likely.

Program Underway

The turnpike program is now well underway in many segments of the country. As of Oct. 15, 1954, there were 1143.8 miles of turnpike completed and in operation. There are 1878.5 miles under construction; 3614.7 miles authorized but not financed, and 677.8 more proposed. The amount under construction will cost $2,956,448,000 and the authorized mileage an estimated $4,499,000,000.

Meanwhile, the National Highway Builders Assn. has four committees studying the capacity of the highway building industry to handle the program the President will recommend. One committee is studying the capacity of equipment manufacturers, another materials and supplies, the third the capacity of engineering personnel, and the fourth the contractor capacity.

Can Handle Job

Findings made by this group will be confidential to the Clay committee. It is understood that there are some "spotty" shortages to be overcome in such unrelated directions as cement and engineering personnel, but the industry is confident it can handle any size program Congress approves.

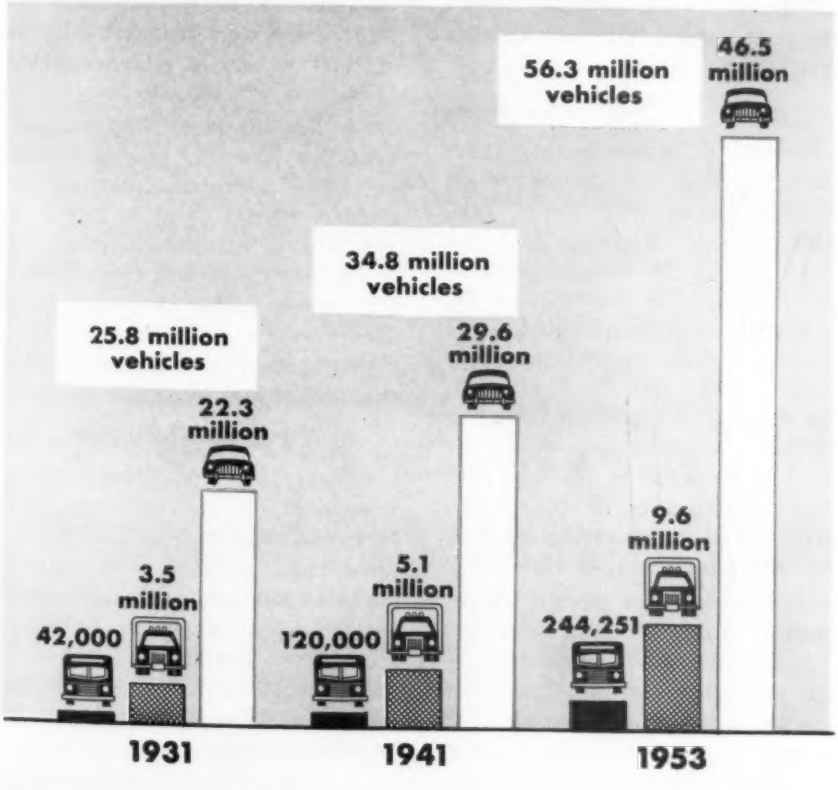
Under such a program, road building equipment would be a major factor. In fact, mechanization and increased productivity have resulted in a drop of wages and salaries of on-site labor. In 1946 wages and salaries accounted for 31.1 pct of construction cost but in 1953 had dropped to 26.4 pct.

Save Federal Funds

On a $5 billion yearly program, it is estimated that $1 billion would be earmarked for rights of way and engineering. A minimum of $2 billion worth of construction equipment would be required to handle a program of that size.

In spite of the awesome size and cost of the outlined program there is an important economy factor involved in it. After it is completed, annual expenditures of all governmental units would drop to $4½ billion, considerably less than the $6,402,000,000 that will be spent this year in a losing battle.

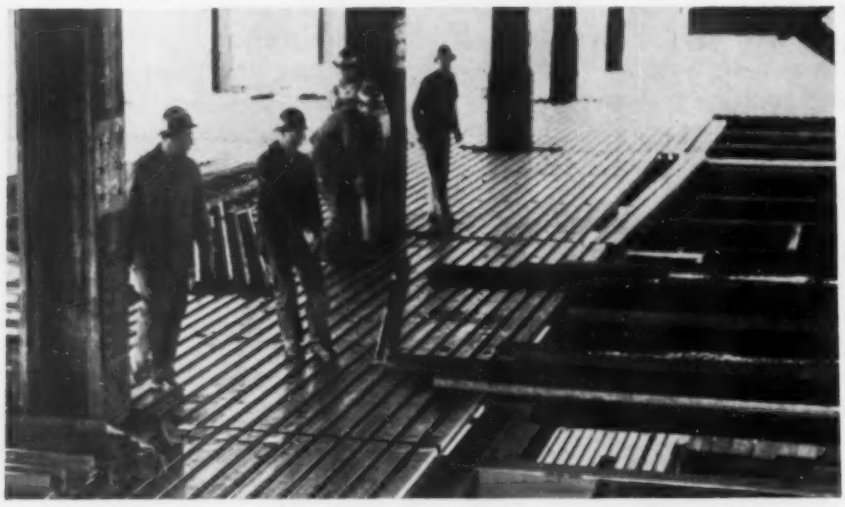
Growth of Motor Vehicle Registrations



CONSTRUCTION

FLOORING: Market Gains for New Type

More producers enter structural underfloor field . . . Started in 1937, made first big gains after war . . . Contractors like it for above-ground work . . . Chicago Prudential Building to use them—By K. W. Bennett.



STARTING work on steel subfloor for Chicago Prudential Building.

◆ FOR COMMERCIAL floors—a little less concrete, a lot more steel in 1955. Structural underfloor — commonly 16-gage steel sheet formed into a system of parallel conduits with a 2.5-in. concrete overlay, and welded to the structural girders of multistory buildings—is in for a strong selling push.

Where structural underfloors captured about 2-3 bids in 10 tries back in 1947, one enthusiast believes they were capturing 4-5 bids in 10 this year. System began with H. H. Robertson, Pittsburgh, officially in 1937. Detroit Steel entered the market in the Forties. When steel underflooring for multistory buildings began to make rapid advances following the postwar easing of steel sheet supplies other firms began eyeing this ripening market.

As of this month, newcomers R. C. Mahon, Inland Steel Products Co., and Plasteel were bidding on jobs. The veteran H. H. Robertson captured the Prudential Building at Chicago, the city's first skyscraper since the early Thirties and amounting to 38 floors and $1,000,000. Inland Steel Products is in the tooling stage, Plasteel will begin carrying structural underflooring at scattered warehouses in January. Meantime, all are reported bidding on construction jobs for 1955.

Gets Office Boost

Structural underflooring provides for electrical wiring to be carried through the "cells" running parallel the length of the floor. The H. H. Robertson flooring, for instance, incorporates 3⅛ in. wide cells on 6 in. centers. The flooring is laid over light structurals and ties into the steel building frame. A light covering of 2.5 in. of concrete is poured over the flooring when in place to provide a level top surface which can be drilled to string wiring through the buried hollow steel cells.

Contractors like it for above-ground work. Flooring proceeds at the same rate as the steel skeleton, providing storage space and safe footing. Not recommended for ground floors, steel underflooring is not common in the one-story plants now being built but is getting its impetus from the attached multistory office buildings and commercial building generally.

Uses Aluminum

Moving with steel underflooring, though preceding it in length of service, has been the accelerated use of under-floor ducts with concrete floors in commercial buildings. Using steel tubing and steel junction boxes, the fabricator provides a network of junction boxes and ducts that is laid on the base concrete floor, then buried with another layer of concrete.

Newest entrant in list of producers is Howard Foundry, Chicago, offering cast aluminum junction boxes and what the firm believes is a more standardized set of fittings than has been used in the past. These systems can be economic in very small installations. Howard's first job—480 ft of duct buried in a supermarket floor.

Though the move seems a natural for Howard, equipped with extensive nonferrous casting facilities, official entry in the field followed a careful appraisal of underfloor ducts and their potential future. Called by conservative observers a "$20,000,000-a-year market" and "virtually untapped," the market looked good.

Commercial Building Up

General Electric, notable for a fiber duct, Walker Brothers and National Electric Products Corp., have been credited with leading in this particular application of electrical equipment to building structures. Immediate outlook seems excellent. October building awards established an all-time high for the industry.

FREIGHT: Wise Management Saves Money

Manufacturers can save as much as 15 pct by combining pickups or deliveries to take advantage of truckload rates . . . Three extra stops are allowed . . . Can help penetrate new markets—By G. T. McMaster.

◆ WISE traffic management can save you money.

This is particularly true for manufacturers of metalworking hard goods because their weight makes cost of shipping a very important factor in the sales price.

THE AUTHOR, G. T. McMaster, is District Manager of The Baltimore Transfer Co.-Motor Freight Express, Inc. System.

This was all but forgotten by some firms during the sellers' market. But the competitive pressure on industry to cut costs has caused some traffic managers to explore every cost-cutting wrinkle.

Management is keenly aware of cost cutting potentials in good plant engineering, in modern office systems, in efficient machinery, and in sound tax planning. . . . But in the field of "profit-wise" transportation, too little has been explored.

It is obvious that if you can reduce your shipping (and receiving) costs you can widen your profit margin. But wiser transportation management also provides several other benefits.

Lower shipping costs, for example, can often be the lever in opening new accounts. It can be the key to a whole market in which your product has been unable to compete.

During the past 20 years there has been a gradual shift toward decentralization of manufacturing operations. Instead of the one big plant, many firms have moved bag and baggage into smaller, closer-to-market operations.

As long as supply lagged demand the advantages of this type operation were not so obvious as they are now. But with profit margins narrowed and competition intense, transportation savings take on added significance.

A fine opportunity to save money exists for companies who can consolidate small shipments going in the same general direction.

For example, our experience has been that savings as high as 15 pct can be realized on truck shipments between Philadelphia and Richmond — if the manufacturer will combine pick-ups for Baltimore and Washington with the Richmond consignment.

The savings are possible because of the sharp difference between truck load and less than truck load rates. Extra charges for stop-offs at intermediate points are very modest when weighed against the difference in rate between partial and full truck load. This is shown in the case history. Note that saving of 14.2 pct was made even while paying for a 1000 lb deficit in weight.

The stop-off rule reads "three stops are permitted exclusive of receipt of the original part of the shipment and the final delivery at destination."

CASE HISTORY . . . Cut Costs by Consolidating Shipments

ASSUME the XYZ Corp., Philadelphia, has scheduled the following shipments to be made the same day:

To John Doe Co.	Baltimore, Md.	5,000 lb
To Jack Roe Co.	Washington, D. C.	5,000 lb
To Henry Moe Co.	Richmond, Va.	12,000 lb
	Total Weight	22,000 lb

If these shipments were made individually, freight bills (without tax) would be calculated as follows:

To Doe Co. LTL rate would be 74¢ per 100 lb or	$37.00
To Roe Co. LTL rate would be 82¢ per 100 lb or	41.00
To Moe Co. LTL rate would be 88¢ per 100 lb or	105.60
Total freight cost (without tax)	$183.60

BUT . . . XYZ Corp. decided it could save money by consigning these shipments on Bill of Lading as follows:

Henry Moe Co., Richmond, Va.	12,000 lb
With stop off at:	
John Doe Co., Baltimore	5,000 lb
Jack Roe Co., Washington	5,000 lb

The freight bill was calculated as 23,000 lb at 62¢ (TL rate to Richmond). The stop off charge is 12¢ per 100 lb. But in this example the $7.06 minimum per stop applies to each stop. Thus, the freight bill was:

23,000 lb at 62¢ per 100	$142.60
2 stop offs at $7.06	14.12
Total freight bill without tax	$156.72

The Saving was $26.88 or 14.2 pct.

SCHEDULING: Math System Pays Off

Firms save money, boost output with mathematical programming . . . Can schedule production for top output, lowest cost or best profits . . . Will save on paperwork . . . Offer training program—By *T. M. Rohan.*

◆ A TEAMWORK proposition — using all the horses rather than just the fastest—is saving thousands of dollars today through mathematical programming. It's a Twentieth Century version of the old mathematician's law of the ratio of advantages.

Mueller Brass Co., Port Huron, Mich., with 100-150 machines, has shown actual production savings of $100,000 in a year on one operation with the system. A tube mill study there showed profits could be increased 35 pct by following the mathematical programming setup.

Production increases of up to 20 pct were accomplished in a year using the system at SKF Industries with 120 automatic screw machines. At another firm with 25 automatics, the system was set up by remote control and is saving about $20,000 annually. H. J. Heinz Co. is saving "several thousand dollars" semi-annually in freight by using the principles.

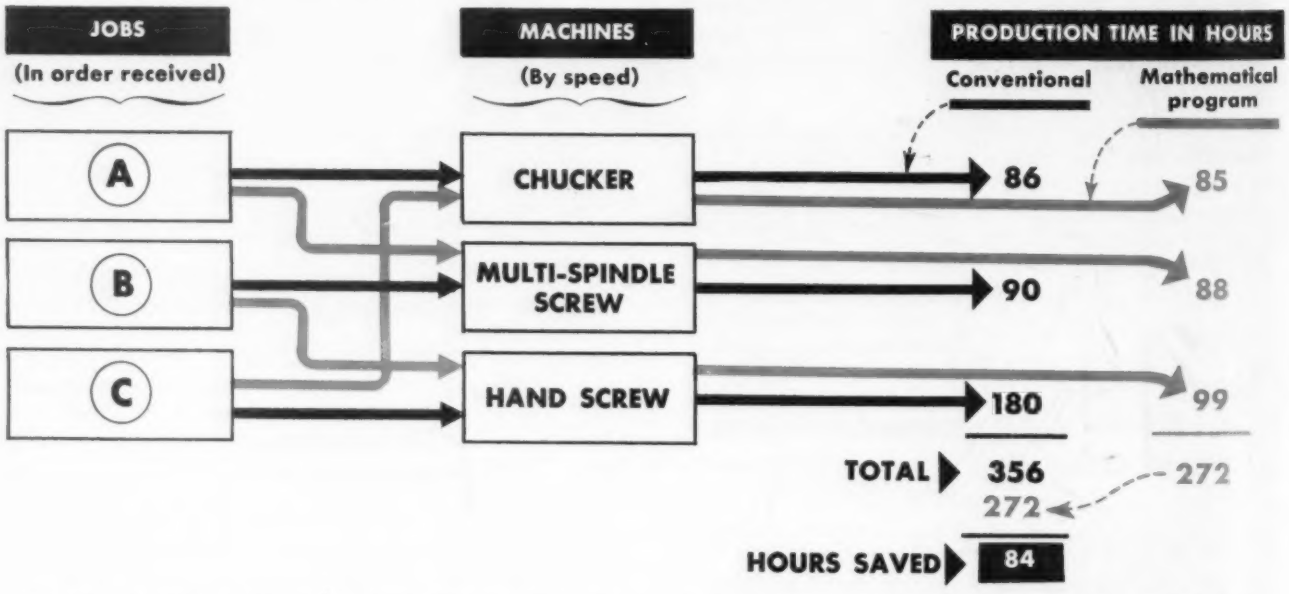
The system has also resulted in major savings through subcontracting, improved inventory control and justification for new equipment.

At present there are an increasing number of firms using mathematical programming and several colleges and consulting firms are actively promoting the work. (See THE IRON AGE, Feb. 18, 1954, p. 76). At least one, Executive Services of Cleveland, offers training programs in the application of these techniques as well as field installations.

Pressing need of production in World War II forced mathematicians from their classrooms into machine shops resulting in the Operations Evaluation Group, a counterpart to England's Operations Research Group. Their work—which was a basis for War Production Board scheduling by plants — has been reduced to practical terms of what items to schedule in what order on what machine for (1) highest output, (2) lowest cost, (3) highest profit or (4) a variety of other objectives.

Reduced to its simplest terms, it means that in shooting for the highest output, for example, the fastest machine is not always immediately loaded to the hilt and slough-off put on slower machines. Rather, all machines are given a speed rating *For Each Item Produced.*

When emphasis is on keeping costs down, different ratings, previously worked out, are used. Other



Simplified application of Mathematical programming for three machines shows 84 hours saved from original 356 necessary. In conventional scheduling Jobs A, B and C are received in that order and scheduled on machines in order of speed, i.e. the chucker, multi-spindle screw and hand screw. In Mathematical Programming all orders are held in Scheduling until shop is ready. Biggest order (C) although last received is assigned to fastest machine where it is turned out in 85 hours rather than 180. This offsets longer time on smaller orders and slower machines with net gain of 84 hours. In Mathematical Programming the advantage shifts with each product. A larger number of machines also complicates the technique.

variations are used for highest profit. System has even been used to streamline office paperwork.

Plant scheduling departments normally schedule orders as received to the limit of the fastest machine. Additional orders are put on the other machines. Work of scheduling is thus expedited and the schedulers desk is always current.

In mathematical programming, each order as received is given a preference rating for three or more machines. These are held at the scheduler's desk until the week's work is to be laid out. When actual scheduling begins, wherever normally slower machines have a speed advantage on a particular job, it is assigned to them.

Solutions Are Rapid

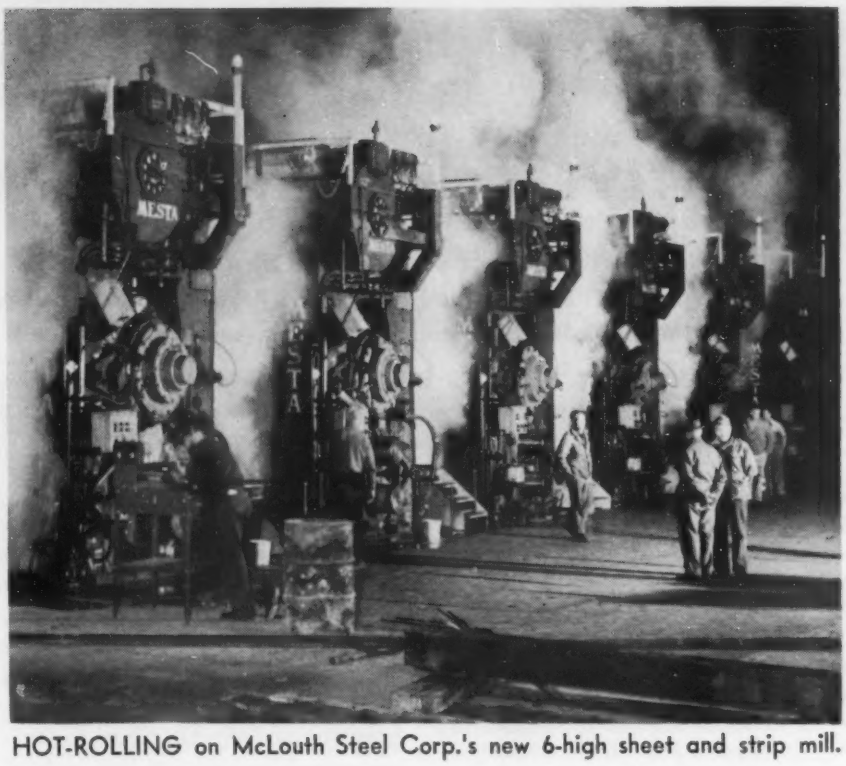
Mechanics of the system are readily taught ordinary clerical workers and a schedule for 100 machines can be solved in 2 to 3 hours.

By this same method, students of mathematical programming, after a day's instruction at a recent Executive Services training program, were able to shave production time in a class problem taken from actual schedule from 10,300 hours to 8,300 hours. This amounts to a time reduction of 19 pct or time for 24 pct additional output.

Mechanics of setting up such a system are relatively simple under qualified supervision at the start. The methods normally used are approximations and do not necessarily give exactly the best answer. Large scale computers are needed for more precise answers. Approximations, however, are generally sufficient. And with practice, refinements are made which bring the solution very close to the best theoretical answer and far better than by conventional methods.

System is well adapted to independent shops having 100 to 150 machines or in similar size departments of larger firms. It can be set up for this size shop for an average cost of about $2200 representing 4 weeks installation time. If plants elect to send representatives to the 3-week seminars in Cleveland costing $290, they return and instruct company personnel. Executive Services Consultants point out that cost of installation by this method is generally less since students can apply principles to operations they already know.

In a recent highly complicated blending firm scheduling program, the plant representative was able to set up the system with only a week's consultation after taking the course. For an outside consultant at least 6 weeks work at the firm would have been necessary.



HOT-ROLLING on McLouth Steel Corp.'s new 6-high sheet and strip mill.

Inventories Improve

Manufacturing inventories rose $100 million in October—reflecting a buildup of stocks of raw materials and components by automobile firms and their suppliers—while retail inventories were pared by $400 million to bring total inventories $4.4 billion below the same period a year ago.

Nondurable stocks at all levels declined about $350 million during October. Durable stocks were generally down, largely from automobile changeovers and clearance of 1954 models. Stocks of durable goods at retail declined about $250 million, after seasonal adjustment, while retail stocks of nondurable goods dropped $150 million during October.

Total sales in October amounted to $46.4 billion.

Steel:

McLouth starts new 6-stand, $25 million hot sheet mill.

A new 6-stand hot rolling mill went into operation at McLouth Steel Corp.'s Trenton, Mich., plant last week. The $25 million mill, capable of producing sheet steel up to 60 in. wide, has a capacity of 150,000 tons per month.

Steel will roll off the modern mill at a speed of 2500 fpm. It will roll carbon and stainless sheet and strip steel mostly for the automobile industries in Detroit.

The operation of the mill is another step in McLouth's $100 million expansion program.

Weir Issues Denial

E. T. Weir, National Steel Corp. chairman, denies that his firm has ever been interested in acquiring McLouth Steel Corp. (THE IRON AGE, Dec. 9, p. 103.) In a statement to THE IRON AGE he said, "We have never given consideration to the acquisition of McLouth Steel Corp. in any form or manner."

THE IRON AGE story named six steel firms that had been "linked with McLouth as possible purchasers."

INCENTIVES: Can Protect Your Estate

Your business is a vital part of your estate . . . And your key employees must carry it on after your death . . . Properly selected incentives can cement their loyalty, cut financial worries, save taxes.

"If all the buildings and equipment in the Bethlehem Steel Co. were destroyed—I could build again. But if, in one fell swoop, I were to lose my key men, I would, indeed, be a ruined man."—Charles M. Schwab.

◆ IMPORTANT as your key men are to your business now, they will become even more important to your heirs. A significant aspect of estate planning is encouraging the loyalty of employees who have the know-how to keep the business going during the difficult period following the owner's death.

Problem is to give the key man sufficient incentives to hold his interest in the business and still keep both his and the company's income taxes at a minimum. Take the simple example of a cash bonus:

If it is given all at one time, the recipient may find it pushes him into a much higher income tax bracket for that year. Thus a great deal of his reward could be consumed in additional income taxes. By spreading the payment over a period of years it will usually cost the company no more and increase the net benefit to the employee.

What worries the key man is the future security of himself and his family. He is disturbed by his inability to save due to high taxes and living expenses. He is concerned with loss of earning power in his declining years and the effect this loss will have on the protection of his wife and children. It's just plain common sense for an employer to free his key men from their worries so they may devote all their energies to their jobs.

Cash salaries and bonuses on which the employee must pay taxes at the peak of his earning ability have obvious shortcomings for this purpose. The solution lies instead in a variety of plans designed to give the employee the security he needs through postponed compensation, while keeping income taxes at a minimum. Here is a brief review of the more commonly used devices of this sort:

• **Pension and Profit Sharing Plans . . .** Much has been written about employee-benefit plans, such as qualified pension and profit-sharing plans, by which substantial sums are set aside for the future enjoyment of the employees. At present, such sums are an income-tax deduction for the employer. The employees are taxed only when they receive the benefits, not when the money is set aside.

Both types of plan accomplish approximately the same purpose. Under a pension plan both contributions by the employer and the benefits to the employee are fixed. Under a profit-sharing plan neither contributions nor benefits are fixed. The employer is required to make contributions only in those years that money is available.

The employer can obtain a tax deduction in the year in which he makes the contribution and the employee can escape taxes until he actually receives his money. But to obtain these benefits, both types of plan must conform to the law and Treasury Dept. regulations. As a consequence, it is usually not possible in small companies to benefit key men to the exclusion of other employees or to the extent desired.

• **Accident and Health Plans . . .** Various forms of group life, accident, sickness, and hospitalization insurance have become an integral part of employer-employee relations. In most instances, however, the benefits are small and many firms are supplementing such plans with additional accident and sickness insurance on key men. Under the internal Revenue Code of 1954 you as employer may deduct the premium payments. These are not considered as income to your employees, even though individual policies are issued to them. But any weekly benefits they receive over $100 per week are taxable to them as compensation.

• **Limited Death Benefits . . .** The law also permits an employer to pay amounts up to $5000 to the widow or other beneficiary of a deceased employee. An income-tax deduction may be taken by the employer in the year or years payments are made. And such payments are tax-free to the heir.

To provide funds for such pay-

Protect Your Key Men

If your business is to continue to benefit your heirs after your death, it is essential that your key men be able to carry out their duties effectively and are willing to stay on the job. Adequate incentives for them, designed to give appropriate financial reward with a minimum of tax penalties, are an important part of your estate planning. Various incentives plans and their tax structures are discussed in this article, last in a series presented by THE IRON AGE in cooperation with Provident Trust Co. of Philadelphia and John J. Buckley, Provident vice-president. Earlier articles in this series appeared in the issues of Sept. 16, Sept. 30, Oct. 7, Oct. 14 and Nov. 4.

These Are Basic to Sound Estate Planning . . .

This study of incentives for your key employees concludes the series of articles designed to review the highlights of estate and financial planning for owners of closely held businesses. Here are the main points of each article:

1. If your business is not already incorporated, consider whether it should be . . . Determine on the basis of the earnings record for the past few years whether the income tax picture is likely to be improved by incorporation . . . Bear in mind the other advantages of the corporate form.

2. Review your present will . . . Make certain it is really what you want to insure the proper care of your family at your death . . . If you have no will or an inadequate one, get your lawyer to draw one immediately . . . Tomorrow may be too late.

3. Plan the disposition of your estate at your death . . . Give special attention to the federal death tax law . . . Consider the tax picture as a whole—taxes on your wife's and children's deaths as well as your own . . . Tax savings possible through proper planning may surprise you.

4. Don't put property in the joint names of yourself and your wife without careful study . . . Remember that you can't control such property by your will to accomplish the tax savings and other advantages a well planned estate can offer.

5. Be sure there will be enough cash in your estate to pay the taxes and other death costs . . . Otherwise your heirs may have to sell your business, your home, or other property at a sacrifice.

6. If you can afford to make gifts to your children without jeopardizing the security of yourself and your wife in your old age, consider the substantial income and tax savings that can result from such gifts.

7. Loyal key men can be the most valuable asset of your business both during your life and after your death . . . Give them the incentive to stay with you . . . Choose among the various means available to give them a sense of security with a minimum of income taxes to them and to the business.

ments, many employers insure the life of the employee in favor of the company. The premiums paid are not a deductible business expense. Nor are the proceeds included in the taxable income of the employer when the employee dies. But they are deductible as a business expense when paid by the employer to the beneficiary.

• **Executive Employment Contract** . . . In many larger businesses the top men would get very little net after taxes from a salary increase. As a remedy, the executive employment contract has come into wide usage. These contracts usualy provide for payments to an employee after he retires, either for a period of years or for the balance of his life. The employee as a rule agrees to perform consulting or other specified services at the request of his employer and not to engage in conduct prejudicial to the company or in a competing business.

• **Stock Bonuses** . . . A bonus in the form of stock in the company gives the employee a stake in the enterprise. The value of the shares at the time is deductible from corporate income and taxable to the employee just like a cash bonus. But as time passes, the key man will share in the benefit of any increase in the value of the shares. To secure the incentive value of such bonuses and to keep the stock of a close corporation from passing to outsiders, it is well to restrict the transfer of such shares unless first offered to the corporation.

• **Stock Options** . . . Only a limited number of shares can be transferred to a key man as a straight stock bonus without pushing him into a high income tax bracket. For this reason many employers prefer to give stock options. These are exercisable within a stated period of years so that the key man can benefit if the stock increases in value.

There are provisions in the Revenue Code giving preferred tax treatment to such transactions if the employee owns, directly or indirectly, less than 10 pct of the company's voting stock, and if other conditions set forth in the Code are satisfied. These conditions are somewhat involved but here is an example of the tax effects of a stock option which would qualify:

At a time when the value of the stock is, say, $100 a share, the employee is given a non-transferable option to purchase a stated number of shares at $95, exercisable at any time within 5 years. Because the option price satisfies the statutory minimum of 95 pct of the value, the option is not treated as compensation. There is no deduction for the corporation and no taxable income to the employee.

Before the end of the fifth year the stock has increased in value to $125, and the employee exercises the option. Still no taxable income to him. Twenty-five years later when the stock is worth $150 a share, the employee, who has since retired, sells some of the stock at its current value. He is then taxed on his profit of $55 a share. But such profit is taxed not as ordinary income but as a capital gain.

As with stock bonuses, the company which gives stock options may also want to put restrictions on the transfer of the shares after the option is exercised.

MANGANESE: U. S. Supplies Growing

Government incentives bolster domestic mines . . . U.S. output still less than 10 pct of need . . . Market easy in '54 because of lower steel production . . . Test low grade ore and slag recovery processes.

By J. C. Adkerson, President of the American Manganese Producers Assn.

◆ MANGANESE supply situation eased considerably in 1954. Ore imports, although falling below the all-time record of the previous year, were substantially in excess of U. S. consumption which declined with production.

Shipments from domestic mines continued to respond to the government's programs for encouraging production but still represent scarcely 10 pct of U. S. needs. With adequate stocks at consuming plants and with steel furnaces operating at low rates as compared with 1953, buying of both ore and ferromanganese was extremely quiet throughout the year.

Price of Indian ore, which constitutes almost half of the current raw material supply, began to be shaded below $1.10 per long ton unit not including duty, early in January and continued to deteriorate until a sharp drop in September brought it down below 75¢. These figures, of course, are for standard 46 to 48 pct ore, c.i.f. U.S. ports. Premiums may be paid for higher grade ores whereas off-grade ores have become more and more difficult to sell to commercial buyers.

Effective Sept. 1, the price of ferromanganese (74-76 pct Mn) was cut $10 to $190 per net ton, f.o.b. furnace, following concessions by foreign suppliers. Government incentive price for small shippers under the car lot program stayed $2.30 for 48 pct ore.

Slow on Quota Boost

The General Services Administration car lot purchase program which guarantees the price of $2.30 per long ton unit for domestic high grade ores until June 30, 1958, or until deliveries total 19 million dry long ton units, promises to continue in effect until the terminal date. The 6 million unit allotment for purchases at the Wenden, Ariz., low grade ore depot has been virtually completed. Purchase allotment at Deming, N. Mex., is unlikely to be exceeded for another year at least.

Higher quotas for Wenden, and also for Butte, Mont., are still under consideration by Office of Defense Mobilization.

No definite action has been taken on the proposal to establish another low grade ore purchase depot in Virginia which would afford southern Appalachian miners the same benefits enjoyed by western miners. Despite lack of market for their lower grade ores, Virginia producers were the main contributors to the car lot program.

One reason given for the Government's go-slow policy in respect to low grade domestic ores is the desire to await the outcome of various research projects aimed at economic utilization of these ores and manganese-bearing slags. Manganese resources of the U.S. are enormous but their physical or chemical structure is such that they often cannot be upgraded to meet conventional use patterns without excessive losses in beneficiation.

Run Pilot Plants

The four major sources of low grade domestic manganese that still challenge our metallurgists are Cuyuna (Minn.), Aroostook County (Me.), Chamberlain (S.D.), and open-hearth slags. However, there are many other sources that could be counted upon if and when suitable economic treatment processes are devised.

Huge sums of government and private money have been spent during the last few years on manganese research and process development. Preliminary reports indicate that the Dean process being tested by Manganese Chemicals, Inc., in the pilot plant at Riverton, Minn., is proving technically successful on low grade Cuyuna ores although final cost estimates are not yet available. The Paterson, N. J., plant for

Manganese Ore Supply, Consumption

Over 35 pct Mn, short tons

Year	U. S. Mine Shipments	General Imports: Ore	General Imports: Ferromanganese, etc.*	Consumption
1950	134,451	1,834,925	221,684	1,838,000
1951	105,007	1,767,580	240,980	2,121,000
1952	115,379	2,668,780	126,502	1,918,000
1953	157,536	3,500,986	252,012	2,254,000
1954†	200,000**	2,300,000	125,000	1,800,000
1955†	300,000**	2,000,000	150,000	2,000,000

* Calculated ore equivalent of imported manganese metal and alloys.
** Excludes 300,000 tons or more of ore containing less than 40 pct Mn.
† Estimated by Author Source: Bureau of Mines

evaluating the nitric acid process of the E. S. Nossen Laboratories, Inc., and the Pittston, Pa., plant of Magnaslag, Inc., for making ferromanganese from openhearth slags were completed and operated in 1954 but further work is indicated before definite appraisals are possible.

Bureau of Mines seems to favor its dithionate process or the high-temperature sulfatization process for ores and the pyrometallurgical approach to slags. Other processes based on sulfur dioxide or sulfuric acid have strong adherents. Still other novel processes are being considered and GSA is even now negotiating with a view to financing one or two additional pilot plant projects.

Scrap:

Trade No. 2 heavy melting at its own price in Chicago.

After a long period of quiet, No. 2 heavy melting was making scrap news in Chicago last week. From the Chicago Mercantile Exchange came word that the Exchange would begin futures trading of the grade on Dec. 15. Heretofore, No. 2 heavy melting has been used on the exchange only as a penalty grade. Failure to fill a contract for No. 1 heavy melting scrap could be offset by filling the contract with an equal amount of No. 2 heavy melting steel at $5 per ton below the contracted No. 1 heavy melting price.

Though the new listing does not affect the $5 penalty when filling a No. 1 heavy melting contract with No. 2 steel, the latter grade can now be traded at its own price and at a normal differential, beginning in December for February and April delivery.

Bundle Auto Frames

From General Iron & Metal Co. came the announcement that their heavy Harris press, believed by the firm to be the scrap industry's largest, was pressing No. 2 heavy melting into a bundle that has been purchased by at least two steel mills in the region and has been put under test by another.

Complete car frames, including axles, are pressed into a 26 x 36 x 60 in. bundle weighing 1800 to 2100 lb. General Iron & Metal believes their product, sold heretofore largely on an introductory basis, can be produced and sold at the going price of No. 2 heavy melting scrap since the press precludes much of the shearing normally required in preparing the grade. The press has folded 9/16-in. carbon plate cut in 5-ft widths into neat bundles of the size described above, and the firm suspects the unit could handle 1-in. plate without damage to the equipment.

Proves Satisfactory

Dynamite inspection and hot metal analyses of the bundles have been reported satisfactory, and General Iron & Metal, with its uniquely large press, seems to be in the equally unique position of being sole supplier of a relatively new form of scrap.

Experimentation with lighter press equipment had been going on for several months, but the addition of axles and the heavy railroad plate found in rail tank cars became possible only when the new Harris press came into operation 30 days ago.

The advent of competitors producing bundled No. 2 heavy doesn't seem likely. General Iron & Metal estimates their financial outlay for the press and related equipment at $400,000.

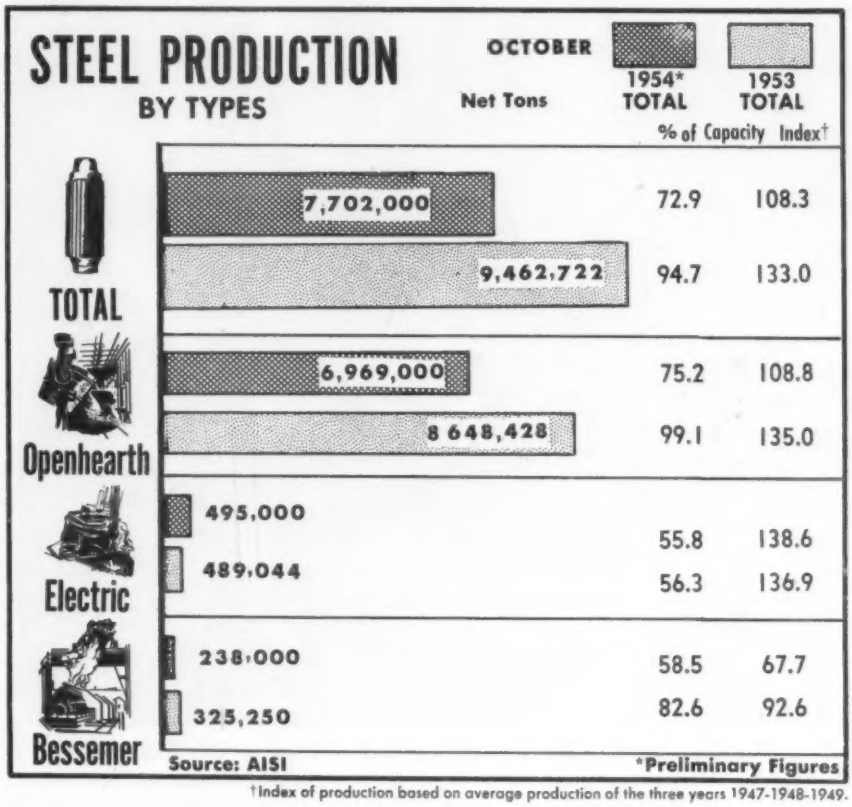
Boost Moly Prices

Climax Molybdenum Co. has increased the price of molybdic oxide about 10 pct and other refined products proportionately. Effective date was Dec. 10. The hike—first in 4 years—was necessary because of higher labor and processing costs, the firm said.

New f.o.b. prices, per lb of contained molybdenum, are: molybdic oxide, $1.25; molybdic oxide briquets, $1.27; ferromolybdenum, $1.46; and molybdenite concentrate, $1.05.

Raise Stainless Prices

Stainless and alloy steel producers have raised prices on nickel bearing grades because of 4½¢ per lb advance in price of nickel. Increases on stainless average 2 pct; alloys are up about 1 pct. See page 166 for details.



DEFENSE

Procurement:

New directive changes military buying rules.

Armed forces procurement rules are to be revised shortly as a means of assuring a nation-wide production base for military items.

Charting the course the revisions must take is a new directive from Defense Secretary Wilson to the military departments. This orders the uniformed services to recheck their equipment buying policies so as to insure the existence of productive sources even under extreme emergency.

The Wilson directive represents a follow-up of the recent Office of Defense Mobilization amendment to its order VII-7. Terms of the amendment give procurement officials authority to depart from the general practice of awarding contracts to the low bidder when the departure appears the best way of keeping a firm mobilization base.

In each military service, the assistant secretary in charge of procurement will be the key man in carrying out the new Defense Dept. instructions. Every 90 days the armed forces must provide Assistant Defense Secretary T. P. Pike with a report on their adherence to the broad-base procurement policy.

Official Pentagon view is that Mr. Wilson's directive is nothing very novel, but that it gives definite form to the Defense Dept. attitude regarding procurement.

Policy outlined by the directive contemplates buying of military goods from sources in a number of geographical areas, rather than from a concentrated group of producers.

Let 'Copter Contracts

New contracts to develop rotorcycles (one-man portable helicopters) for military use are held by Gyrodyne Co. of America, Inc., St. James, N. Y., and Hiller Helicopters, Palo Alto, Calif.

Value of each contract, placed by the Navy, is approximately $200,000. The lightweight rotorcycles are for use by the Marine Corps for observation, liaison, and small unit maneuvers.

The contracting companies were selected following a Navy design competition.

Barmotive Products, Inc., San Leandro, Calif., makes the two-cycle gasoline engine called for in both winning designs.

As projected by Hiller, the rotorcycle is a single two-bladed rotor with a small tail rotor. The Gyrodyne design is for a coaxial, contra-rotating two-bladed arrangement with a fixed tail stabilizer.

Air Force Academy Bids

Contractors' bids on first construction work at the new air force academy site at Colorado Springs, Colo., will be sought next spring and summer.

Construction contractors will be responsible for labor, materials, and supplies when building is started.

Air Force officials say manufacturing and supply firms interested in providing details on any particular product which may be used in the project should get in touch with the Chicago architect-engineers, Skidmore, Owings & Merrill.

Order New Barracks

New permanent barracks to house Army troops at 21 posts in this country, Alaska, and Hawaii will cost a total of $44 million.

Contracts for this construction have been placed in the past two months by the Army. Each of 90 barracks to be built will house 263 men. The new buildings will replace existing, temporary structures.

Contracts Reported

Including description, quantity, dollar values, contractor and address. Italics indicate small business representative.

Replenishment of vehicles 55-60, 1286, $467,661, Visioneering Co., Inc., Cleveland, Ohio.

Tube electron type No. 4-65A, 6000 ea, $445,515, Eitel-McCullough, Inc., San Bruno, Calif.

Tube electron type No. 4 x 150.A trans., 13700 ea, Eitel-McCullough, Inc., San Bruno, Calif.

Modification of cabin cooling units, 1500 ea, $2,200, 500, Airplane Co. Stratos Div., Bay Shore, L. I., N. Y., *S. Savignano.*

CIO HEAD Walter Reuther (right) congratulates Labor Secretary Mitchell for defending compulsory union membership during a talk before the union's national convention at Los Angeles last week.

Report To Management

Big factor in the '55 business outlook —as it is in any year—is how well the auto industry will do. Outlook right now is that it will be a strong year. Car output will be better than it was this year, probably won't quite match the 6.1 million auto output of 1953—certainly won't be up to 1950's record 6.7 million production.

Harlow Curtice, General Motors head, has gone on record with a prediction that 5.8 million autos will be turned out in '55 and there's a very good chance that his mildly optimistic forecast will be right. Here's why:

(1) First reports on consumer acceptance of the '55 models have been highly encouraging.

(2) Dealer inventories of new cars were cut drastically before the new models were introduced. At the end of October, dealers' new car inventories amounted to 250,000 units, the lowest level in more than 2 years. In October a year ago dealers had a glut of 550,000 cars which had a lot to do with the mild production cutback the auto industry went through this year. Detroit won't be under this handicap in '55.

(3) Generally the economy will be uptrending during 1955. Consumers have plenty to spend—through the first three quarters of '54 personal savings were running at an annual rate of nearly $20 billion. All signs indicate consumers are in a spending mood.

Construction continues to steal the spotlight. Construction contract awards through the first 11 months of the year have already topped the figure for all of 1953 and have set a new all-time record, F. W. Dodge Corp. reports.

Residential building has shown the greatest gain, running 28 pct ahead of the 11-month total for 1953. Public and private works and utilities were 3 pct ahead of last year on an 11-month basis, while non-residential building was down a little less than 1 pct. Decline in non-residential construction is due to the very large atomic energy plant contracts that were awarded last year. If these are left out, non-residential building this year would actually be 7 pct above the 1953 figure.

Perhaps the most amazing aspect of the tremendous surge in the construction industry is that despite the record amount of work being done, volume in most categories is barely keeping up with demand. And in some categories—particularly schools and highways (see p. 71)—there is a pressing need for a greatly expanded construction program.

National City Bank analysis of sales and net income figures of 498 corporations in the first 9 months of this year shows what a big factor elimination of the excess profits tax has been.

Sales for these companies were 9 pct under '53 levels and earnings before taxes were off 20 pct. But net income after taxes is 4 pct above '53 levels. Reason for the gain was the end of EPT. With the excess profits tax eliminated, taxes took 49 pct of earnings before taxes. When EPT was in effect taxes took 60 pct of earnings.

There's a new wrinkle in hiring executives. If you think you've found the man you want but still have a few misgivings—have him take you for a short drive.

Idea is that from the way he handles his car you'll have an insight into the kind of an executive he'll be. If he's timid, indecisive in a traffic jam, he'll probably choke up when he has to make an important business decision. If he hogs the road, takes too many chances you don't want him either.

If this idea becomes popular it figures that some New York cab driver will soon move in as head man at U. S. Steel.

INDUSTRIAL BRIEFS

Gets Contract . . . Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia, has been awarded a contract to furnish 6900 ft of double-wall steel casing for the 6860-ft underwater part of the new tunnel-bridge crossing at Hampton Rds., Va.

New Arrangements . . . Norton Co. will announce soon its plans for the leasing, rebuilding, trading-in, and time payment arrangements on some of its standard grinding and lapping machinery.

They've Moved . . . Union Carbide & Carbon Corp. has consolidated its Cleveland offices in a new, modern office building and distribution center at 1300 Lakeside Ave.

New Home . . . A.I.T. Diamond Tool Co., has moved to a new plant at 8221 N. Kimball Ave., Skokie, Ill.

Elected . . . American Institute of Steel Construction, Inc., has elected Earle V. Grover as its president. Mr. Grover is head of Apex Steel Corp., Ltd.

Licensing Agreement . . . Case Hardening Service Co., Cleveland, will now be manufacturing Pacific Scientific Co.'s furnaces and heat treating equipment in the East under a new licensing agreement.

Newly Formed . . . Delaware Valley Steel Works, Inc., has been organized to engage in the fabrication of metal tanks, hoppers, and all types of weldments. Alvin M. Stevens, vice-president and general manager stated that the new company plans to give the growing industrial Delaware Valley the finest service available in its field.

Opened . . . Latrobe Steel Co., Latrobe, Pa., has formally opened its new Cleveland branch office and warehouse at 5572 Brecksville Rd., Independence, Ohio.

Completed . . . Carborundum Co. has completed two new warehouse and office buildings in California, and has reorganized sales, engineering and other services in the West. John G. Fritzinger is manager of the firm's Pacific district.

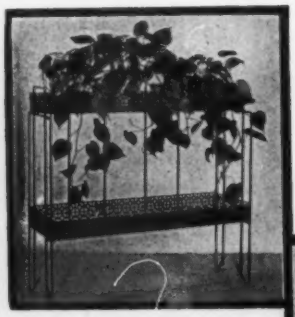
QUANTITY PRODUCTION OF GREY IRON CASTINGS

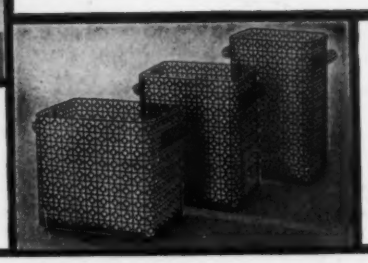
ONE OF THE NATION'S LARGEST AND MOST MODERN PRODUCTION FOUNDRIES

ESTABLISHED 1866

THE WHELAND COMPANY

CHATTANOOGA 2, TENN.





Distributed by Sun Glo Studios, New York, N. Y.

Ideal design for the Ideal Mfg. Co.

With today's trend toward modern styling, Hendrick is becoming more and more important to fabricators of metal products. Typical of these is the Ideal Mfg. Co. of Oskaloosa, Iowa, who manufactures the attractive home furnishing items shown above using Hendrick's Perforated Metal Square Link design.

And this is only one of hundreds of designs Hendrick can supply in commercially rolled metals and gauges with round, square, diamond, hexagonal or slotted perforations. If you would like further information, write Hendrick today.

Hendrick MANUFACTURING COMPANY

37 DUNDAFF ST., CARBONDALE, PA. • Sales Offices in Principal Cities

Perforated Metal • Perforated Metal Screens • Wedge-Slot Screens • Architectural Grilles • Mitco Open Steel Flooring • Shur-Site Treads • Armorgrids

Fits places and budgets that no other loader can!..

Clark's new BULK LOADER

This little end-loader will do many of the things that bigger, more expensive machines can do—*plus a lot of things they can't do!* The Clark BULK LOADER has the shortest turning radius of any machine on the market—5'10". Within its capacity (11 cu. ft., 1200 lbs.), it's unbeatable for handling loosely packed material in cramped quarters—boxcars, narrow aisles, close approaches to hoppers. There's plenty of power, plenty of traction for light shoveling, with speeds up to 8½ mph in both directions. Fully loaded, the BULK LOADER will climb a 14% grade.

Bucket action is also outstanding. Low-level independent tilt-back guarantees full bucket loads every time, permits carrying in lowered position without spillage. The 60 degree dumping action has a full 76 in. clearance under the hinge, 47 in. under the lip.

Compare the performance of this new BULK LOADER against competitive machines. And remember that you'll have no service problems with this new Clark machine—parts and components are mainly interchangeable with the standard Yardlift-20. Service is immediately available from your local Clark dealer, listed in the Yellow Pages under "Trucks, Industrial."

Ask your Clark dealer for a demonstration of the new Bulk Loader. Send the coupon and we'll make the arrangements.

CLARK EQUIPMENT

Industrial Truck Division
Battle Creek 51, Michigan

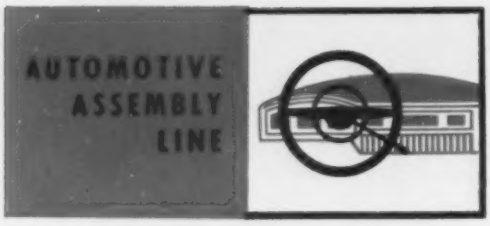
☐ Send details on the BULK LOADER
☐ Contact me for demonstration

Name_____

Firm_____

Address_____

City_____



Chrysler Output Rate Keeps Climbing

Now producing at rate over goal of 20 pct of market . . . Will go still higher in first quarter . . . Sales prospects good . . . Restyling paying off . . . K-W still in passenger car field—*By R. D. Raddant.*

◆ AS THE YEAR went into its closing weeks, the auto industry had to fall back on production for its significant developments.

But even in the usually dull perusal of totals and sub-totals, several significant facts were brought out that deserve to be evaluated. One is the production rate at Chrysler, now over this automaker's goal of 20 pct of the market. A second is that the industry as a whole passed the 5 million passenger car mark last week, assuring 1954 of being the third best year in history.

A Good Record . . . Some of the automakers who had bad years might agree with a former presidential candidate who declares that even second best isn't good enough. However, for a year that was completely without abnormal market stimulating factors, production of better than 5,500,000 cars is something to talk about.

And probably even General Motors and Ford find nothing to be alarmed about over Chrysler's surge in its four divisions. Neither would mind at all if Chrysler's increased share of the market came at the other's expense, providing no inroads were made on their own sales.

Restyling Pays . . . But Chrysler's production rate, plus the fact that it will be increased during the first quarter of 1955, is most encouraging to the company's efforts to regain its formidable position in the Big Three.

It is impossible to evaluate reports by division sales heads of public acceptance, advance sales, and other salesmen's claims to determine how well new cars are going. But advance scheduling of increased production can be taken as evidence of good performance in the showroom in terms of sales.

It also indicates that the tremendous effort and expense of the major restyling of all lines is paying off for L. L. Colbert, Chrysler president, his division heads and stylists.

Still In Field . . . An improved 1955 Jeep will carry the load of the Kaiser-Willys campaign this year. But Edgar Kaiser is still not ready to give up hope of becoming a factor in the passenger car field.

The dressed-up Jeep, with new colors, smoothed-out lines, and carrying a bigger payload in a bigger body, was described to dealers as "your profit line for 1955." Jeep production has always paid off for Willys and later, after the Kaiser-Willys merger, held up its end in an increasingly tough market.

Lower Prices . . . But the passenger car, for either section of the company, never really got going. In fact, it was once widely rumored around the auto industry that the passenger lines would die with 1955. The Henry J, which was once billed as the answer to low priced transportation, expired during the 1954 campaign.

Kaiser has recently acquired facilities in South America and it is understood that the Kaiser-Willys passenger lines may be assembled there for the South American market. The Jeep has always enjoyed an excellent export market.

Lower prices for the Willys Bermuda, a hardtop model, and the Willys Custom, a 4-door sedan, were announced in the new model preview, which originated in a closed circuit TV broadcast last week from New York.

Misplaced Profits . . . Most critics of the auto industry believed that Willys first, and later Kaiser-Willys, could have made a pretty good thing out of concentrating on the utility vehicle. It made substantial profits and enjoyed a good reputation with the public as well as the military.

It isn't known how much of the Jeep's earnings were siphoned off into tooling up for passenger cars, but it is likely that if the money put into the passenger lines had been invested in development of the Jeep, it would be a bigger factor today.

Stress Service Set-up . . . Behind Lincoln's apparent habit of sweeping the stock car section of the Mexican road race is an or-

Cuts Use of Chromium Plating Material by 50%

"Mr. Cost Cutter" reveals how plant saves money while it improves results

Results achieved by an automotive company tell a story of major improvement in chromium plating operations.

The advantages of the Unichrome SRHS Chromium Plating Solution as pointed out by United Chromium were first checked by this company's critical research division. Shortly thereafter, the SRHS solution replaced the ordinary solution in a fully automatic plating machine.

All benefits were confirmed. Loss by dragout dropped since the solution was more dilute. Loss by spray carried off in the ventilators diminished because the higher efficiency of the SRHS bath reduced the wasteful gassing which causes spray. In fact, records show that consumption of chromium plating salts used to maintain the bath was cut *more than half*. In addition – faster plating speed was obtained; also brighter deposits, and better coverage.

This company now has every chromium plating tank in the plant working with, and saving with, Unichrome SRHS Chromium.

MORE WAYS UNITED CHROMIUM HELPS TO SAVE ON COATING OF METALS

Matched Plating Processes

The first set of matched copper, bright nickel, and chromium plating processes has been developed by United Chromium. Compatability of the processes plus the undivided service responsibility they offer can assure the very finest chromium finishes at a new low cost.

Sprayable Vinyl Plastisol

Unichrome Coating 5300, developed by the Organic Coatings Division of United Chromium, cuts costs for corrosion-proofing tanks, ducts, and other equipment. This sprayable vinyl plastisol produces thick chemical-resisting coatings with advantages over sheet and paint linings built up to comparable thickness.

Economical Plating Equipment

United Chromium supplies equipment for complete plating installations. Tanks, rectifiers, heaters, and other Unichrome equipment are, from experience, designed for efficient operation and genuine economy.

UNICHROME
Trade Mark

UNITED CHROMIUM, INCORPORATED
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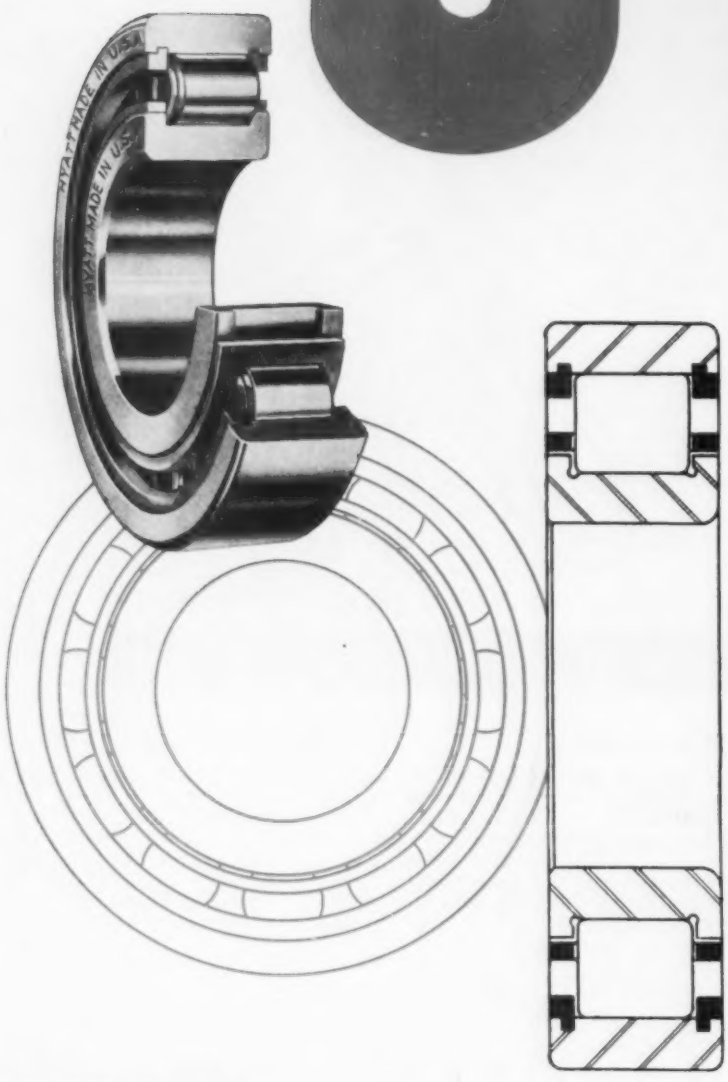
To finish it better and SAVE call in "The Unichrome Man"

United Chromium offers you the advantages of: (1) 25 years of specialized experience in metal finishing; (2) Wide experience in both organic and plated finishes; (3) A diversified line of products for decorative and functional finishing – including plating processes and equipment, protective coatings, chemical conversion coatings for zinc; (4) Thinking geared to cost-cutting, product-improving possibilities.
We'd welcome an opportunity to help you "Finish it better AND SAVE."

Waterbury 20, Conn. • Detroit 20, Mich. • Chicago 4, Ill. • Los Angeles 13, Calif. In Canada: United Chromium Limited, Toronto, Ont.

Another Hy-Load of Utmost Dependability . . .

U-TS



U indicates inner race flanged at both ends

T indicates outer race has 2 retaining rings

S indicates rollers spaced circumferentially by separator

This non-separable Hyatt U-TS is widely utilized for applications where: (1) no provision is made to retain the outer race endwise, or (2) the bearing must be assembled as a unit. It is available in the 1200, 1300, 5200 and 5300 series.

There are nine other basic types of Hyatt Hy-Loads, six of them with separable inner or outer races. Each is engineered to solve specific bearing problems. To find the Hy-Loads that fill *your* bill to perfection, write today for Catalog No. 150 or contact your nearest Hyatt sales-engineer. Hyatt Bearings Division, Harrison, New Jersey.

HYATT

ROLLER BEARINGS

STRAIGHT BARREL TAPER

DIVISION OF GENERAL MOTORS CORPORATION

Automotive Production

(U. S. and Canada Combined)

WEEK ENDING	CARS	TRUCKS
Dec. 11, 1954	154,239*	21,881*
Dec. 4, 1954	148,802	22,387
Dec. 12, 1953	91,858	21,288
Dec. 5, 1953	191,996	21,152

*Estimated. Source: *Ward's Reports*

ganizational setup that gets much of the credit for the victories.

This should take nothing away from the car itself. It takes quite an automobile to last out the grind at the pace set by the Lincoln entries.

Nevertheless, Lincoln people willingly admit that the maintenance and servicing from the team was, as one member put it, "the big thing" in keeping the two Lincolns that finished first and second ahead of the Cadillac entry.

Check Each Night . . . For one thing, the Lincoln crew of 50 experts and technicians were for the most part veterans of the past three Mexican campaigns. For three months before the race, the course was charted and service points picked. This careful planning obviously paid off.

At each service point, usually in an outside area, the crew put up its own light posts, plugged in electric tools, installed drinking fountains and attended to all service details. The Cadillac entry, in contrast, used its own garages along the route.

At the close of each day's run, each Lincoln was gone over with a fine tooth comb, even to the extent that the rear axles were pulled every night in order to make a bearing check.

Benson Ford, general manager of the Lincoln-Mercury Div., is a great believer in the Mexican road race as valuable promotion and publicity. He takes a personal interest in the conduct of the race. However, not all the gain is in terms of promotion. Last week in Detroit the top crewmen and drivers went into a huddle with Lincoln-Mercury engineers. A lot of lessons are learned each year from the race, particularly about performance under extreme conditions of tires, brakes, fan belts, in addition to a great many other parts.

Suppliers:

Hurt by automakers' trend to manufacture own parts.

AUTOMOTIVE NEWS

A somewhat disturbing trend this year has been the comparatively poor showing of many suppliers of the auto industry.

This is due to a combination of factors, the leading one being the trend of the major auto companies to manufacture more and more of their parts. The independents, which continue to rely on parts manufacturers much more than the larger companies, have suffered in the 1955 market and their suppliers have suffered proportionately.

Some have gone out of business entirely. Others have sought diversification. With competition so keen for auto business, profits have been pared to the bone for many suppliers.

Murray Corp. of America is an excellent example of a company that followed this pendulum right out of the automobile body picture entirely. A few years ago, Murray was an extremely prosperous firm, happily making bodies for Ford. Recently it dropped the body business.

B. C. Gould, Murray president, said this: "We decided at Murray that our best interests would be served by promptly withdrawing from the body business, liquidating the assets of that division, and continuing our program of reinvesting available capital in sound and diversified industry."

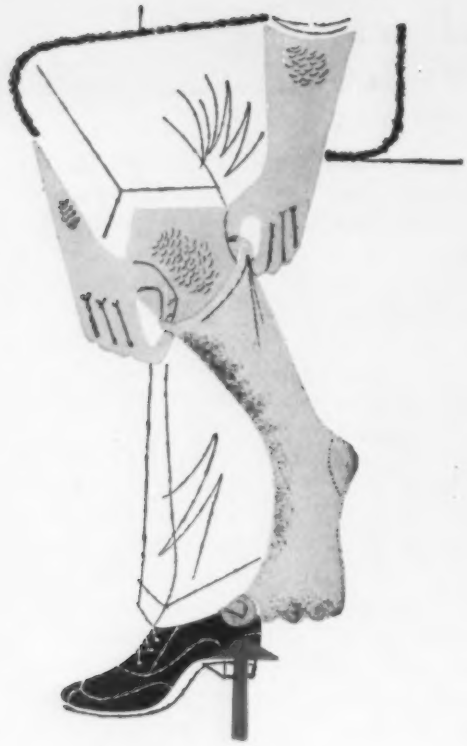
This decision was prompted by the diminishing market among the independents while the Big Three continue to make more and more of their own parts and components.

Motor Wheel Co., a major supplier of wheels to the industry, is following a policy of "keeping our operation fluid enough to meet changes in cycle." This company recently purchased the lawnmower division of Reo Motors and is expanding its Duo-Therm Div. for the manufacture of new incinerators and space heaters.

These are only a few examples, but almost every supplier of the auto industry is making plans to shift into other markets, with the trend to entering consumer fields rather than remain a supplier.

THE BULL OF THE WOODS — **By J. R. Williams**

THERE, DAN, WE'RE PUTTIN' YOU ON TH' NEWEST LATHE MADE-- MODERN IN EVERY WAY!
NOT ME, YOU DON'T! I WON'T WORK ON NO SLOT MACHINE THAT YOU PRESS A BUTTON AN' TH' JOB COMES OUT FINISHED! I'M A ALL-ROUND MACHINIST AN' WANT HANDLES ON IT SO IT'LL TAKE SOME BRAINS TO RUN IT!
THERE'S PLENTY HANDLES ON IT, BUT HE'S HOLLERIN' BEFORE THEY GET TH' PACKIN' ALL OFF--HE CAN'T HAVE MUCH BRAINS!
LE BLOND
J.R.WILLIAMS
12-17
THE COME-DOWN
Copr. 1954 by NEA Service, Inc. T. M. Reg. U. S. Pat. Off.



a hole here is a nuisance...

a hole here is an advantage

Crucible Hollow Tool Steel Bars are saving time and money for more and more members of the metalworking industry. By using these hollow bars you eliminate drilling and boring operations, increase machine capacity and cut scrap losses.

Now, you can get hollow bars of any of Crucible's famous tool steel grades, in almost any combination of O.D. and I.D. sizes. And you can get *immediate* delivery of five popular grades from your local Crucible warehouse—KETOS® oil-hardening, SANDERSON® water-hardening, AIRDI 150® high carbon--high chromium, AIRKOOL® air-hardening, and NU DIE V® hot-work tool steels.

Your Crucible representative can point out ways to save time and money by using Crucible Hollow Tool Steel Bars.

CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking

HOLLOW TOOL STEEL

CRUCIBLE STEEL COMPANY OF AMERICA • TOOL STEEL SALES • SYRACUSE, N. Y.

Try to Boost Workmen's Compensation

Labor Department drafting new "model" compensation act . . . Will urge states follow model . . . Would raise industry's costs . . . Labor Dept. seen trying to evade "anti-labor" campaign tag—By G. H. Baker.

◆ RESPONSIBILITIES of industry under the workmen's compensation system are slated for a violent increase if the U. S. Labor Department has its way. Undersecretary of Labor Arthur Larson is drafting a new "model" compensation act, which state legislatures will be urged to ape in their local laws.

Mr. Larson, who takes the view that his drastically tightened model law is a social necessity, proposes that employers' responsibility for industrial illnesses be expanded to include more types of accidents and diseases, some of them only indirectly related to on-the-job conditions, and that the costs which firms be required to pay be hiked.

Evade "Anti-Labor" Tag . . . Proposal is part of Labor Dept. efforts to offset charges fired during the recent political campaign that the Eisenhower Administration is "anti-labor." In this proposal, no approval of Commerce Dept. or the White House is needed, because there is no federal legislation involved.

Forty-four state legislatures meet in 1955, and most of them are expected to take another go at rewriting their compensation laws. The proposal is a favorite of labor unions, and because most state legislatures operate under even more pressures than Congress, many are expected to follow Mr. Larson's recommendations.

Business representatives in Washington are getting an opportunity to take an advance peek at the proposal, but Mr. Larson is now expected to go ahead with his plan in spite of opposition.

Expect UMT Rhubarb . . . It's an even bet whether there will be louder protests by congressmen or by industry executives over the new military manpower proposals to be sponsored by the Defense Dept.

If Defense Secretary Wilson allows his recommendations for an improved reserve program to be known as a "modified UMT," both Republicans and Democrats on Capitol Hill will be incensed. There's a high voter-irritation content in the initials UMT, and by political timetables the 1956 election is just around the corner.

What Wilson Wants . . . What Mr. Wilson wants is this: extension of the draft act, now set to expire on June 30; a system for giving six-months' training to about 100,000 youths per year and placing them in organized reserve units; authority to hold these trainees in reserve status for some 7 years.

This last provision is highly disturbing to businessmen. They've already visualized the problems likely to result when the potential manpower pool is tapped to supply "normal" draft quotas as well as men for the special half-year training program. Now they are concerned about increased costs they may incur if they carry on their payrolls any substantial number of men who must report for active duty training each year for seven years.

If military leave pay must be added to vacation pay for these reservists, industry officials are certain to protest strongly to their congressmen.

Coal Seeks Govt. Help . . . Depressed Pennsylvania anthracite coal industry is asking government procurement officials to give more consideration to use of anthracite in heating large public buildings. They see the large government market as a valuable customer and a possible means of easing the depression that has gripped the coal industry for several years.

Mining officials will work on representatives of the Veterans Administration, Post Office Department, General Services Administration, Department of the Navy, Army and Air Force, Defense Department, Federal Housing Administration, Bureau of Prisons and the National Bureau of Standards.

Chances that government will use new types of burning equipment is improved by a recent as-

what's new?

NO. 29 OF A SERIES.

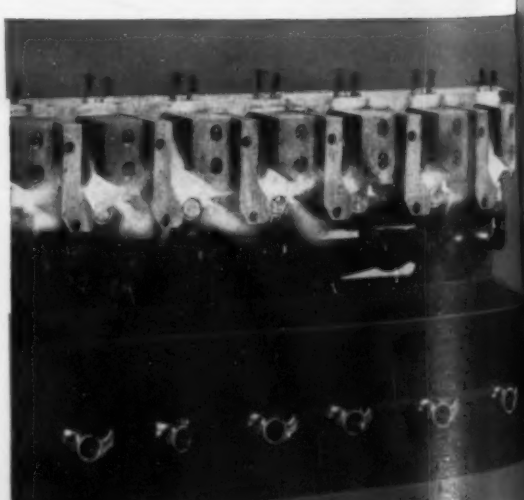
in tight spots like these...

flamatic puts heat where you want it

You pick the spot, and a **flamatic** puts heat precisely where you want it. In this selective heating application, for example, a two-station **flamatic** spot hardens cups and pads on automotive rocker arms. The machine hardens 7 pieces to Rc 60 in one station while the operator loads the other.

This is another example of **flamatic's** on-the-spot solution of selective heating problems, combined with ingenious tooling to meet specific production requirements.

This combination has paid off in profitable production of many other parts, in commercial heat treat shops and large plants. Cincinnati Flamatic heat engineers will be glad to apply their skills to your needs. Call them in, or write for Publication No. M-1861.



CINCINNATI **flamatic**

PROCESS MACHINERY DIVISION
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO, U.S.A.

surance by Mobilization Director Arthur S. Flemming that the industry is officially rated as vital and that Washington will underwrite a limited degree of economic security for the mines. Possibilities include increased exports to friendly countries, or some type of stockpile plan under the long-term stockpile.

Building:

November 8 pct above last year; 11 months up 5 pct.

New construction took its usual seasonal dip in November, but the $3.3 billion worth of work put in place set a new record for the month, topping November a year ago by 8 pct.

Joint statistics compiled by the Departments of Commerce and Labor show that more than one-third of the month's total was for private housing as home construction activity continued booming at an unprecedented rate for this time of year. Private residential building of $1.3 billion for the month was 25 pct more than a year ago.

Construction of office buildings and churches also set a November record, and private industrial building picked up. The eleven-month total for all construction is $34.1 billion, five pct more than the same period a year ago and strengthens predictions that the full year will reach $37 billion. The two departments have estimated next year's total will top this year's by 7 pct, reaching $39.5 billion.

Seaway Consultants

A new four-man board of engineering consultants has been appointed to the St. Lawrence Seaway Development Corp. by Administrator Lewis G. Castle.

Named to provide professional engineering advice on Seaway problems are C. E. Blee, utilities engineer on various government and private power projects in the U. S. and Canada; F. W. Edwards, member of the staff of Stanley Engineering Co., Muscatine, Ia.; E. M. Fucik, vice president Harza Engineering Co., Chicago, and C. M. Wellons, consulting engineer of Pittsburgh.

Employment:

Non-farm jobs increasing, reversing seasonal trend.

Nonfarm employment reversed a seasonal trend between October and November, rising by 53,000 persons to hit a peak for the year, and unemployment remained fairly stable. But despite improvements in recent months, factory employment is still 900,000 below a year ago and 6 pct below peak 1952 levels.

Total employment was 61.7 million in November, down 400,000 from October. Nonfarm employment reached 48.7 million, a new peak for the year, according to statistics prepared jointly by the Departments of Commerce and Labor. Total unemployment increased 152,000 to reach 2.8 million, but was less than the 10 pct gain normal for the month.

Increased factory employment was accompanied by a rise in the work week to 40.1 hours and average weekly earnings of manufacturing workers rose to a new high of $72.98.

Sharply stepped up auto production was primarily responsible for the increase in nonfarm employment, although substantial increases were registered in primary and fabricated metals, electrical machinery, leather and retail and service trades.

Nonfarm increases were not enough to offset the decline in agriculture and food processing lines caused by completion of harvests.

"It's nothing out of the ordinary, plenty of executives get butterflies in their stomachs."

See Spending Dip

Businessmen will invest in new plant and equipment at a fairly brisk pace in the first quarter 1955, making outlays at an adjusted annual rate of $26 billion.

As predicted by government economists, this will fall behind current quarter's estimated rate of $26.6 billion. However, the expected decline does not obscure a generally optimistic outlook for industry expansion.

Builders of transportation equipment propose to spend a little more for plant and equipment in the coming quarter than in the first 3 months of 1954. Machinery producers expect to match first-quarter '54 spending. Programs of primary metals concerns indicate a drop in capital outlays in the January-March period, compared with the corresponding months this year.

Adjusted annual spending rate for all durable goods producers in the first quarter is to be $5 billion, against $5.5 billion in first quarter 1954.

Steel Mill for Spain

Export-Import Bank is making available up to $1.2 million in loans for a Spanish firm to buy American equipment to construct a new steel finishing and fabricating plant on the outskirts of Madrid.

The loan is to be used by the Manufacturas Metalicas Madrilenas Co. of Spain to help purchase a total of $2 million worth of equipment from the Lewis Machinery Div. of the Blaw-Knox Co. and Westinghouse Electric International Co.

Lewis will supply a three-high hot-rolling mill, a two-high finishing mill, a skin pass mill, spare rolls and parts, and Westinghouse will supply a 5000 kw gas turbo-generating unit and other electrical equipment.

. . . IF IT'S A HIGH PRODUCTION PROBLEM . . .

ASK BAIRD ABOUT IT

ENGINE PISTONS *travel fast* THRU *automatic* ASSEMBLY *of* BAIRD 6-SPINDLE CHUCKERS

With push-button operation in many large metal working plants, the Baird Chucker has graduated from a valuable single unit to an invaluable assembly for completely automatic production lines.

Higher, constant speed is one reason . . . minimum manpower . . . and maintenance of close tolerances during continuous removal of metal is, perhaps, the outstanding feature. The photo above shows an assembly of three Baird Chuckers automatically machining engine pistons in a leading automobile plant.

In this instance, operations include finish turning of the engine piston and finishing the oil ring grooves to size.

This Model 76H Chucker (7″ chucks, 6-spindle horizontal machine) combines, in a single indexing cycle, such operations as turning, facing, drilling, tapping, threading, grooving and chamfering, if required.

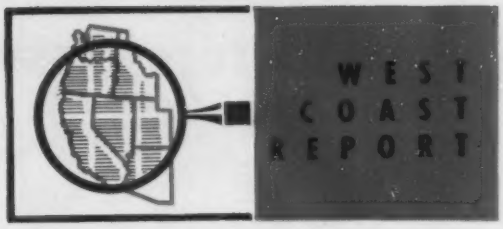
Electrical and mechanical safety devices prevent damage when any motions are out of time or sequence. All tooling is easily accessible . . . spindle speeds are individual and variable. Design and construction assure long service life. If you require repetitive production of this nature . . . hand load or unload or entirely automatic . . . ask Baird about it.

3BA54

THE BAIRD MACHINE COMPANY
STRATFORD CONNECTICUT

WHERE YOU WILL GET THE HELP OF SPECIALISTS ON THESE ESSENTIAL PRODUCTION PROBLEMS:

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS



Start Metalworking Clearing House

Southern California firms form non-profit group to attract, facilitate handling of eastern, midwestern business . . . Stress freight savings, shorter deliveries, possible lower costs—By R. R. Kay.

◆ DO EASTERN and Midwest manufacturers know the size and scope of the metalworking industry on the West Coast? Many westerners think not. What to do about it?

Some 30 southern California firms formed a non-profit clearing-house-type corporation to bring more eastern manufacture to their plants.

It's an impressive group of manufacturers, well-established in metalworking, electronics, plastics, and rubber. Organized as Industrial Manufacturing Services Corp., member plants do an annual business of $50 million and employ 3500.

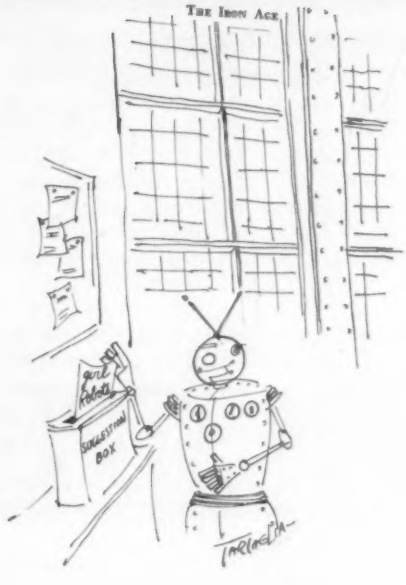
How It Works . . . Each company does a different manufacturing operation among which are brazing and plating, heat treating, tool and die making, ferrous and nonferrous casting. There's no overlapping. Several categories of production work are still open and IMSCO says it will have a well-rounded group when it has about 43 member-companies.

Here's how it works. When an eastern company asks whether an IMSCO member can do a certain job for him, specialized committees in production, design, engineering, purchasing, and marketing review the inquiry. If a member or group of members can handle the work, the query is passed on for action. If not, the committees suggest who in the area is equipped for the job.

Stress Advantages . . . IMSCO members say they have this to offer: An eastern manufacturer who assembles in the West, by having parts produced in the West, saves freight costs and gets a better break with on-schedule deliveries. And in some cases he gets the work done cheaper.

Here's an example: A Chicago piano manufacturer who assembles in California formerly bought a steel casting in the Midwest. An IMSCO member now produces it, saving the piano firm a Chicago-Los Angeles freight bill.

Dicker With Detroit . . . Right now the organization is having talks with certain Detroit auto makers about production of parts and complete components for West-Coast-assembled cars. There's a big market here for automotive parts manufacture. In 1954, the West fabricated only 30,000-40,000 tons of parts and imported 1 million tons for the half-million cars assembled in the West Coast plants. (See THE IRON AGE Aug. 12, 1954, p. 95.)



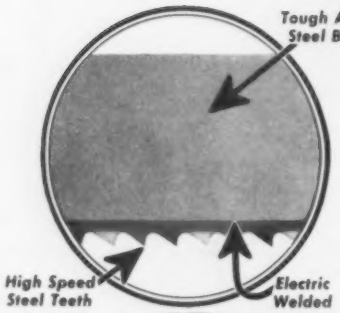
Members have the facilities to produce for a wide variety of industries: automotive components such as rear axles, carburetors, shock absorbers, brake shoes; springs for the railroad industry; vacuum cleaner and refrigerator parts; tools and dies; castings; powder metal parts; plastic and rubber goods; and electronics.

More Pots? . . . Another western aluminum reduction unit coming? . . . Reynolds Metals Co. is looking into the feasibility of setting up a power plant and aluminum reduction unit near Buffalo, Wyo., in the Lake Desmet area.

Build Wind Tunnel . . . North American Aviation, Inc., is building a $5 million wind tunnel at El Segundo, Calif. Airplane and missile designs will be tested at speeds up to 3½ times the speed of sound. Expected to be one of the nation's largest, privately-owned wind tunnels, the new facility will play a key role in solving complex design problems.

Pre-stress Beams . . . Boeing Airplane Co., Seattle, claims its new 300,000-sq-ft materials handling building will be the world's largest using prestressed concrete beams and girders. The University of Washington will strength-test the first pourings. The test beam will measure 38 ft 10 in. long and weigh 10,000 lb. The 44-ft test girder will weigh 22,000 lb.

Features Essential to Top Hack Saw Blade Performance



UNBREAKABLE—to saw FASTER.

Composite construction (a narrow high speed steel tooth edge electrically welded by the MARVEL-invented process to a tough, non-brittle alloy steel body), means that MARVEL high-speed-edge can be subjected to the MAXIMUM feed pressure that any hack sawing machine is capable of applying. MARVEL blades need not be "babied" for fear of breakage!

SHATTERPROOF—for SAFETY.

MARVEL blades never shatter or "explode" as do the ordinary "brittle" blades shown at left which so often cause personal-injury accidents such as the loss of an eye or severe laceration and expensive damage to the sawing machine. Operators who use MARVEL blades exclusively soon "get the habit" to apply heavier feeds, greater blade tension, higher speeds—to do their work faster, because they know they are SAFE with MARVEL.

SHARPER, PREMIUM-STEEL TEETH—to wear LONGER.

Teeth are accurately machined by a MARVEL-invented process that assures sharper tooth points and positive uniformity of tooth shape and degree of set from end-to-end of every MARVEL blade. The steel used in the tooth edge is carefully selected from the finest high speed steels available throughout the world, regardless of cost or source—truly premium steels, without premium cost.

QUALITY CONTROL—to assure UNIFORMITY.

With more than a quarter century of *experience* in inventing, perfecting, and producing welded-edge hack saw blades, MARVEL has provided its own laboratory with the most modern metallurgical instruments and techniques known to the applicable sciences for the specific purpose of maintaining highest possible quality control. Coupled with rigid tests and meticulous inspection of every MARVEL blade, uniform quality is assured.

These are only a few features that make MARVEL High-Speed-Edge Blades such outstanding performers.

Ask for the latest MARVEL Cutting Tool Bulletin and the name of your closest MARVEL Distributor.

MARVEL *Metal Cutting* SAWS
Better Machines-Better Blades

Manufactured only by
ARMSTRONG-BLUM MFG. CO. • 5700 West Bloomingdale Avenue • Chicago 39, U.S.A.

MACHINE TOOL HIGH SPOTS

Builders Help Customer Education

Gisholt is at least third to publish buying guide . . . New brochure analyzes rental and time payment plans . . . Sums up MAPI formula, new tax depreciation laws . . . Will be useful—By *E. J. Egan, Jr.*

◆ RIGHT ON THE HEELS of Gisholt Machine Co.'s recent announcement of a 5 pct downward revision in machine tool down payments (THE IRON AGE, Dec. 9, p. 104) comes an 8-page brochure called "What You Should Know About Buying and Renting Machine Tools."

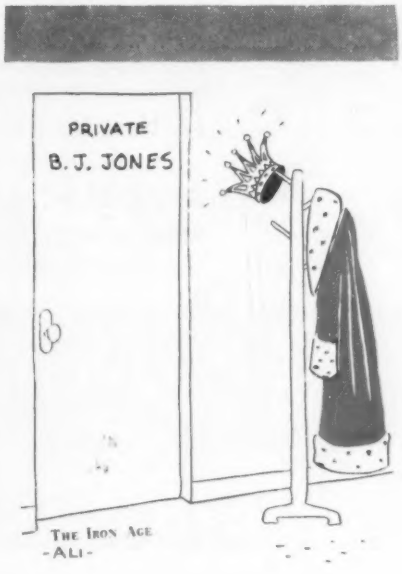
It briefly sums up the company's analysis of its own rental and time payment plans, as well as the Machinery & Allied Products Institute's equipment replacement formula and the new tax depreciation provisions. The booklet will probably be viewed with welcome relief by purchasing agents and plant supervisors already buried under a flood of bulky reports and volumes—all telling how each should handle his capital equipment needs.

Tells All . . . Though Gisholt is the first to declare officially a 20 pct down payment for tools purchased on time, it's at least the third builder in recent months to offer a handy pocket guide to prospective machine tool buyers. Jones & Lamson has been credited with the first combination booklet; others are following. With some of these brochures you can get a concise MAPI equipment replacement analysis chart. It tells the prospective buyer exactly what facts should be weighed in considering machine tool replacement, and it follows up with three pages of explanatory matter telling precisely how to use the chart.

To the buyer who wants to make his machine tool replacement program more economical but is wandering in a morass of unrelated reports, these MAPI formula charts alone are proving a needed boon. Evolution of a standardized machine tool replacement program has been viewed hopefully by machine tool builders for years. MAPI's method may not be the idea that some builders would like, but the industry at large seems willing to accept it as the best to date.

Need Data . . . At the same time an increasing number of metalworking firms have realized their own need for a regularly scheduled tool replacement program. Many smaller firms have been stopped cold by their lack of concise information on the MAPI formula, depreciation options, and the relative advantages of capital-in-hand as opposed to capital tied up in increased or replacement machine tool purchases.

Much verbal and some printed information can be acquired from any machine tool salesman, including the simplified MAPI chart. But a booklet containing complete and comparative information that could affect buying decisions can be kept conveniently at hand.



For instance, the Gisholt pamphlet says of its straight leasing plan, "Minimum cash requirement. No depreciation allowed but rental costs are tax deductible as expense."

Of outright purchase, "Requires largest immediate cash expenditure but offers lowest final cost. With full ownership there are no restrictions as to alterations or use."

Of leasing with option to buy, "Minimum cash requirement. Deduction of rental costs for tax purposes is questionable. Machine cannot be depreciated until purchased, and then presumably as a used machine at the slower straight line rate."

Clears Fiscal Phrases . . . If phrases like "Straight Line Rate" are still a little cloudy, the builders' booklets offer a brief but pithy analysis of this. "Sum of the Digits," "Declining Balance" and other fiscal catch phrases are also spelled out in simple terms, composed in easy-to-read form.

Will Steady Labor . . . Automation will mean more predictable and stable employment in factories of the future, according to Milton O. Cross, Jr., president of The Cross Co., Detroit. He foresees a broad upgrading of laborers to maintenance men, skilled tradesmen to highly trained technicians.

Chills Cast From Chateaugay Pig Iron Resist Heat at 3400°F

Casting surfaces resistant to heat and corrosion are extremely important to Dobbie Foundry & Machine Company, Niagara Falls, N. Y.

The casting illustrated is a chill or trough. It is used to direct the flow of molten chromium into molds. The casting surfaces must withstand temperatures over 3400° F.

To obtain surfaces resistant to such heat, Dobbie uses Chateaugay, Republic's exclusive premium Pig Iron, in its cupola mixture.

Resistance to heat and corrosion are only two of many benefits foundrymen enjoy with Chateaugay. It also produces an unusually fine and uniform grain structure with high wear resistance. Chateaugay castings machine beautifully and economically. Chateaugay shrinks evenly, fills adjoining light and heavy sections completely.

For the complete story on Chateaugay, the low-phosphorous, copper-free Pig Iron, call in a Republic Pig Iron Metallurgist. He has all the facts. He can show you how to obtain high strength, uniformity and machinability throughout every casting.

Just let us know when you would like him to call.

REPUBLIC STEEL CORPORATION

GENERAL OFFICES • CLEVELAND 1, OHIO

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REPUBLIC PIG IRON

"CHATEAUGAY"	REPUBLIC	REPUBLIC
Low-Phosphorous, Copper-Free	(Northern) Foundry, Bessemer Basic and Malleable	(Southern) Foundry and Basic

REPUBLIC STEEL

The Iron Age SALUTES

Del S. Harder

He's been "getting things done" in U. S. auto manufacturing since the hand-crank days. Now, his development of automation guarantees low-cost, efficient production in the gas-turbine era of the future.

If not the father of automation, Del S. Harder, vice-president of manufacturing, Ford Motor Co., certainly qualifies as a favorite uncle, having been a leading force in developing systems of automatic handling of parts between progressive machining and production processes.

Del is generally credited with coining the term "automation" itself, while he was serving as general factory manager of the fabricating division of General Motors' Fisher Body Div. from 1934 to 1944.

The first spectacular success of automation came when Del applied it to the loading and unloading of presses at Ford's Dearborn plant, in the late '40s.

In the automobile business since the hand-crank days, (he joined Yellow Taxi Cab Co. in 1912), Del has grown up with mass production—is one of the reasons for its growth.

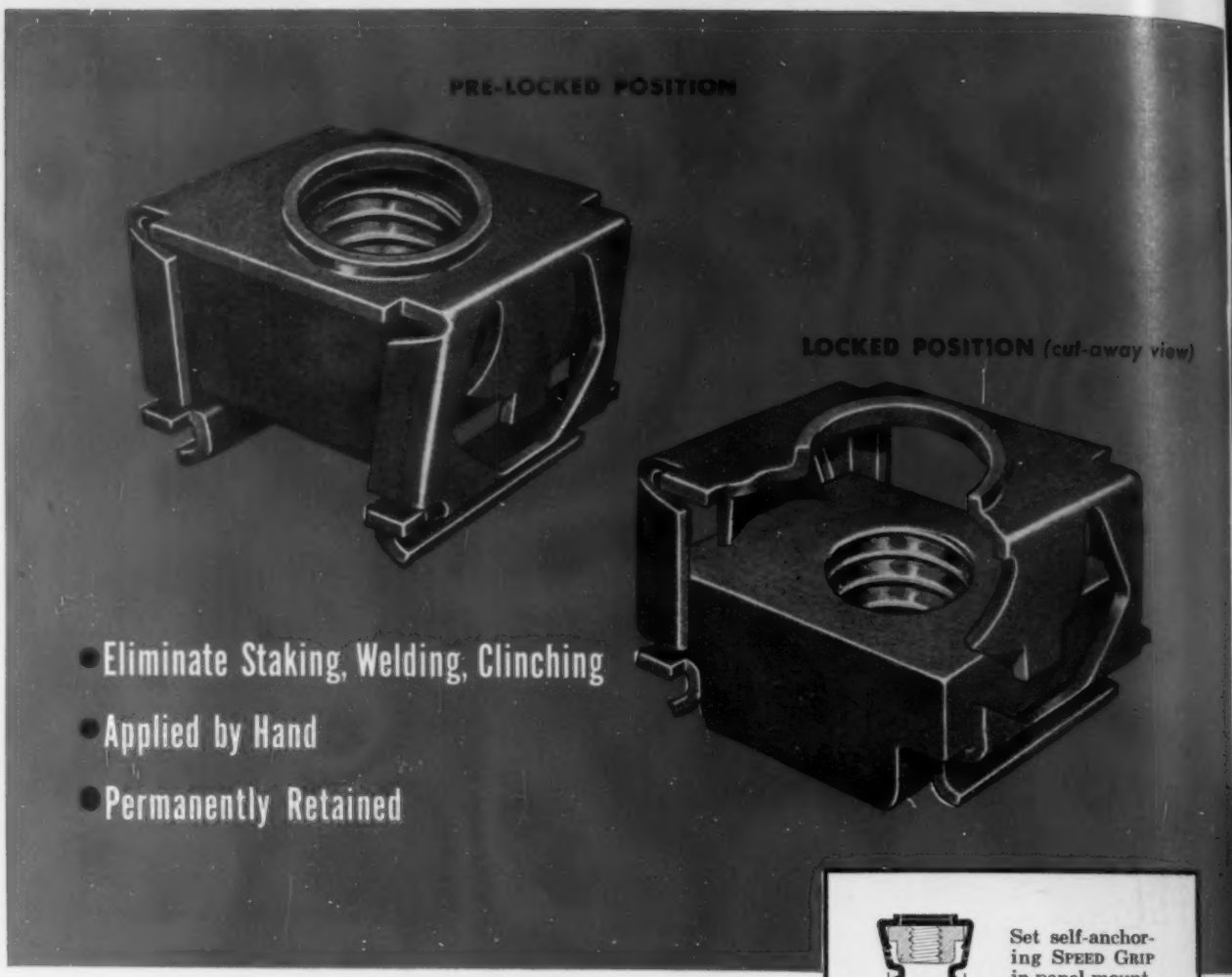
Some well-earned recognition of Del's pioneering work came last fall when he received the first annual Presteel Award, sponsored jointly by the Pressed Metal Institute and Worcester Pressed Steel Co.

The Award was given "for his contributions to enlarging the field of metal stamping through automation, through encouraging employee training to provide more men skilled in pressing metal and through openly sharing his ideas with the industry."

Del joined Ford in 1946, worked out the principles of automation in the design of a complete factory, Ford's Buffalo Stamping Plant, which went into operation in September 1950.

Prompted by a conscientious desire to give others the benefits of his experience in developing automation, Del has written many articles and delivered a number of lectures on the subject.

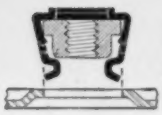
Born in Delhi, N. Y., Del got his engineering training at night while he was working for Yellow Cab and Chevrolet in New York.



New, Self-Anchoring SPEED GRIP®
cuts assembly costs in half!

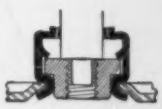
Whatever your present method of attaching square nuts to panels, new self-anchoring SPEED GRIPS can do the job faster, easier, better. This unique fastener has spring steel "mechanical hands" that permanently lock the nut in bolt-receiving position. It cannot be dislodged even with rough handling. Applied after painting or porcelainizing, there is no clogging, retapping or masking of threads to bother about. *And* it is ideal for blind location attachments.

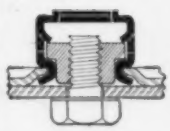
Total up the savings in application time—in expensive assembly equipment—in handling time—in assembly steps—and you'll switch to self-anchoring SPEED GRIPS—the newest addition to the complete Tinnerman line of Nut Retainers.



Set self-anchoring SPEED GRIP in panel mounting hole.

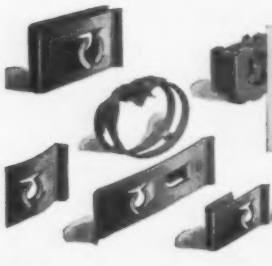
Simple tool presses nut into locked position.





Heavy duty nut in locked position — permanently retained — can't rotate, rattle or be dislodged.

Write today for free copy of new detailed SPEED GRIP Bulletin, No. 335. Tinnerman Products, Inc., Dept. 12, Box 6688, Cleveland 1, Ohio. *In Canada:* Dominion Fasteners Ltd., Hamilton, Ontario. *In Great Britain:* Simmonds Aerocessories, Ltd., Treforest, Wales. *In France:* Aerocessoires Simmonds, S.A., 7 rue Henri Barbusse, Levallois (Seine).



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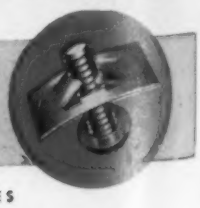

MORE THAN 8000 SHAPES AND SIZES

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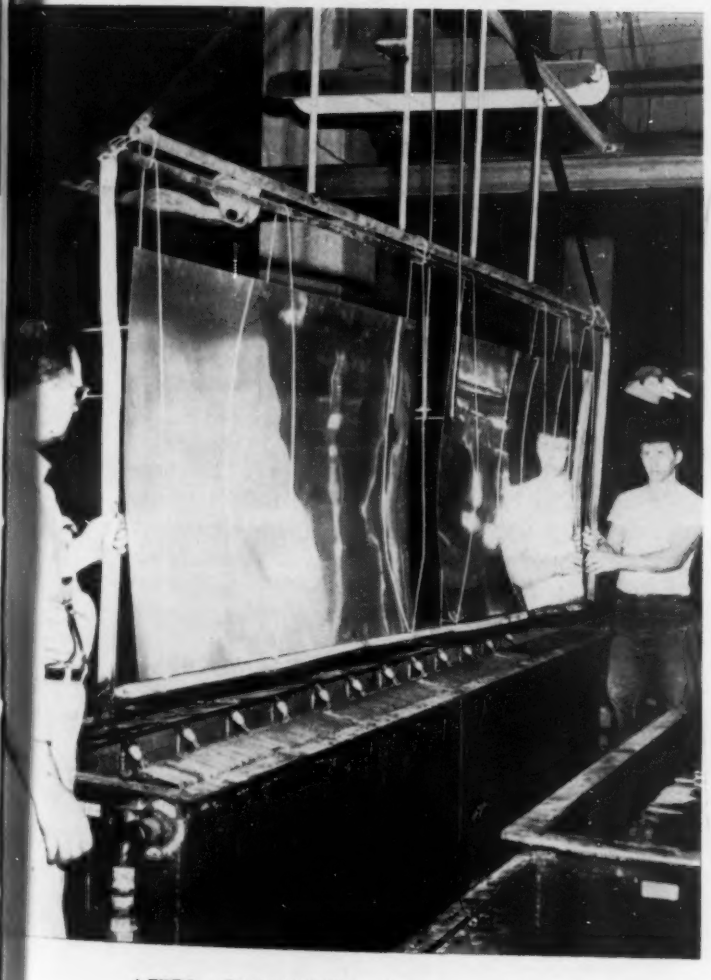
Finishing methods—

Surface Treatments Improve Properties, Broaden Uses of Aluminum



AFTER CLEANING, aluminum skins are spray rinsed. Ink markings are completely removed, leaving a smooth, bright finish.

By C. C. COHN
Director of Research and Development
Colonial Alloys Co., Philadelphia

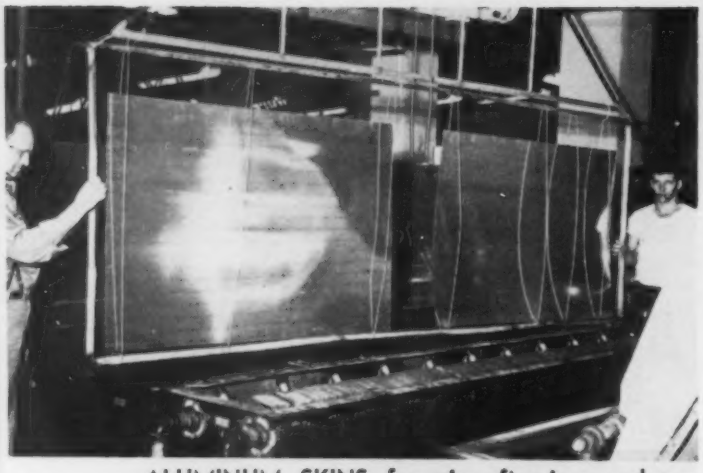
◆ Methods of surface treating aluminum, either for decorative purposes or greater protection, vary widely . . . They range from mechanical treatments as polishing, scratch-brushing and sandblasting to chemical and electrolytic treatments for a number of unique finishes.

◆ Anodizing, for example, improves corrosion and abrasion resistance, provides a good base for paint and insulates the surface of an electrical conductor . . . Etched and brightened surfaces are accomplished by chemical treatments.

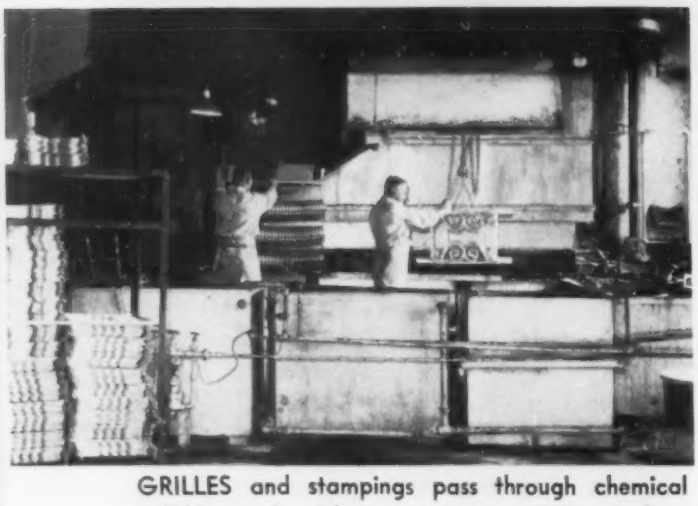
Part I

◆ TREMENDOUS GROWTH in aluminum production in recent years can be attributed directly to the natural combination of desirable properties in this metal and its alloys. Surface treatments further enhance the usefulness of aluminum through better appearance or improved properties.

Aluminum is often used without surface finishing. However, there are many specific processes for obtaining special surface effects. The field of aluminum finishing is wide and varied with respect to character of the finish and the process employed. Selection of a process for any application depends on the job requirements as well as on the limitations and



ALUMINUM SKINS for aircraft wings undergo cleaning operation in preparation for painting. Immersion time is about one minute.



GRILLES and stampings pass through chemical polishing cycle. After processing, parts have reflectivity values up to 86 pct.

advantages of the various processes available.

Before applying any chemical surface finish the work surface must be cleaned thoroughly. Shop soil, oil and grease are the most common contaminants. Cleaning may be done by one of several techniques: alkaline (spray, brush and dip), acid (brush and dip), solvent (hand dip and vapor, and electrocleaning.

A number of different mechanical processes are used to obtain particular finishes. These include grinding, polishing, barrel burnishing, scratch-brushing, sandblasting, embossing and hammering. Grinding, for example, may be used to prepare the surface for subsequent treatment. If a satin finish is desired, scratch-brushing may be used.

Electrochemical finishes for aluminum include anodizing and electroplating. In anodizing, the oxygen produced at the anode by passing a current through an acid solution combines with the aluminum to form an aluminum oxide surface film.

This hard film increases corrosion and abra-

Oxide films formed by anodizing are porous, thereby aiding dye penetration . . .

sion resistance, and provides a key for painting, an insulating coating for electrical conductors, and may be dyed in a variety of colors. The type of aluminum alloy anodized will affect the color and hardness of the film.

While there are many processes for anodizing and dyeing, the basic ones are the chromic acid process by Bengough and Stuart; the sulfuric acid processes by Gower, Stafford O'Brien and Partners, Ltd., and Aluminum Co. of America; the oxalic acid process by Hojin, Rikagaku and Kenkyujo; and the sulfamic acid process by Reynolds Metals Co. A new dual-film anodizing process, patented by Colonial Alloys Co., is also rapidly gaining acceptance.

Aluminum surfaces can be electroplated with various metallic coatings by methods ordinarily used for other common metals. In addition to decorative effect, aluminum surfaces are plated for certain specific advantages. Chromium, copper, brass, nickel and silver can be plated on aluminum by conventional methods.

Zinc forms good undercoating

Commercial acceptance of plating on aluminum is due mainly to development of methods for better bonding of deposits. Special anodizing procedures have recently been developed to form a modified anodic film which firmly bonds the deposit to the surface. Of the many pretreatments for increasing adhesion, zinc immersion has great commercial importance. In this process, a self-arresting deposit of zinc is atomically bonded to the base metal. Electro-deposits of various metals can then be applied to the zinc coating.

Chemical treatment of aluminum is used to achieve a variety of specialized films. The time of chemical treatment is short, no electricity is required, equipment is simple, and no serious racking problems are encountered. Some chemical treatments may be used to etch and brighten the surface. Others are applied for protection.

Mirror finishes retain luster

The etch-type treatment provides a white-matte or frosted finish. The procedure generally used involves caustic soda solutions and subsequent acid neutralization. The caustic soda dip, however, removes the natural oxide surface film and must be followed by supplementary finishing treatments for corrosion protection.

Mirror-bright finishes on aluminum by non-electrochemical methods have reached a very high level of quality. The process known as the Jewelry Finishing Process provides reflectivity values up to 86 pct. These surfaces are not dulled

by subsequent chemical or electrochemical oxidation nor affect the service life of the part.

Thicker natural oxide films on aluminum, hence greater corrosion and abrasion resistance, can be obtained by low-cost chemical treatments. Oxide films formed by chemical treatment generally serve as excellent pretreatments for painting due to their porous nature.

Some oxide films formed by chemical treatment may be colored by absorption of inorganic or organic pigments and dyes, but the colors are not as brilliant or light-fast as those obtained on oxide films formed electrolytically. The oxide film produced chemically is resistant to pressing, rolling and bending, but will crack during deep-forming operations. Thus, it is best to apply chemical treatment after forming.

Among the processes for producing chemical oxide or other conversion coatings on aluminum are the modified Bauer-Vogel process, the EW process by Erftwerke, Anodizing and Chemoxide III processes by Colonial Alloys Co., Alrok process by Aluminum Co. of America, Bonderite 170 by Parker Rust Proof Co., and the Alodine and Deoxidine processes by American Chemical Paint Co.

Coloring of aluminum, other than by painting, may be accomplished on oxide films formed by anodizing and chemical treatment. It can also be done by direct surface treatment by chemical means alone. Oxide films may be colored by absorption of organic dyes into porous anodic films, by treating the oxide film with inorganic materials, and by the formation of colored films directly from addition agents in the electrolytic bath.

Coloring by chemical means alone is simple and economical. Although several methods have been proposed, few have proved commercially satisfactory because of poor film adherence.

Oxide films formed on aluminum by anodizing are generally very porous and highly absorptive. This is advantageous because it permits dye penetration. However, to insure color fastness, or to effect an impervious and nonabsorptive film, the film must be sealed. Sealing locks in the color which otherwise would rub off or fade quickly.

EXTRUSIONS emerging from a cleaning solution are about to enter an anodizing tank. Process gives the dual film a strong bond.

It is often desirable to coat aluminum with paint or lacquer for decoration or protection. Painting on aluminum surfaces is more difficult than on most metals due to the thin even layer of loosely held oxide always present. Degreasing is not effective enough to produce a good paint base. The surfaces must be etched, or be provided with a porous coating by anodizing or conversion coating.

Commercially, aluminum is prepared for plating by chemically depositing a zinc or cadmium layer, or forming a porous oxide coat. In the first preparation, cleaning the surface is vitally important to good electroplating.

The cleaning practice has been to degrease, alkali-etch, selective acid pickle, zincate dip and then electroplate. A preferred system is to clean, deoxidize by acid, alkali etch, selective acid pickle, zincate dip and electroplate.

New cleaning system preferred

The important deoxidizing step after cleaning may be done by a hot sulfuric-chromic dip. However, a room-temperature method which will not cause etching is preferred. This may be done using a 10-pct solution of sulfuric acid by volume to which is added a proprietary salt. The solution is used as a dip for about one minute at room temperature.

The second method of preparation, wherein a porous anodized film is first formed on the aluminum, is less critical as to cleaning. A preferred cycle would be to clean, deoxidize, anodize, then plate. Alkali cleaners are used widely and usually serve satisfactorily. Two general types are used, etching and nonetching.

Animal and vegetable oils can be emulsified and removed by alkali cleaners. Mineral oils, commonly found in cutting and slushing oils, are not emulsifiable by alkali cleaners. It is therefore desirable to first degrease with an organic solvent capable of removing mineral oils. Nonetching alkali cleaners may be used afterwards to produce a wettable surface. If an etching type alkali cleaner is used, it should be preceded by a deoxidizing treatment.

Nonetching alkali cleaners generally contain trisodium phosphate or soda ash, inhibited against etching by silicates. Silicates sometimes react with the aluminum to form insoluble stained areas. An alkali cleaner has been developed to eliminate this difficulty.

Etching type alkali cleaners generally include caustic soda as the etchant, with or without addition agents which are added for brightening, sludge suspension, setting and other purposes. Degreasing alone, prior to alkali etching, will usually create an uneven etch. Deoxidizing should precede the alkali etch for fast etching.

These cleaners tend to leave a smut or film on

Cleaning for spot welding should be by degreasing followed by deoxidizing . . .

the surfaces of certain aluminum alloys. This film can be removed by a solution of 1:1 nitric acid and water. Even better results are obtained with the same material used for deoxidizing. It has no odor, its cost is low and it has long life. It also has wider applicability in that it removes certain smuts which nitric acid does not remove. Dilute sulfuric acid is its base, to which is added a long-life salt.

Preparations for plating can also be applied prior to painting, anodizing, oxidizing, phosphatizing, chromating, chemical conversion coating, etching, welding, brazing, soldering and spot welding. Anodizing, and chemical and electrolytic polishing, may be preceded by cleaning alone.

Preparation for painting should preferably include a paint base in the form of an approved conversion coating. It is not good practice to paint following cleaning only, or following degreasing and alkali cleaning or etching only, because poor paint adhesion results. If aluminum is to be mechanically polished, prior cleaning, followed by deoxidizing, will cut down polishing labor and time and result in a more uniform surface.

Spot welding requires metal surfaces free of grease, oil, dirt and scale, and particularly free of oxide. Degreasing, or degreasing followed by alkali cleaning or etching, is not satisfactory. Alkali cleaners often tend to form an oxide of their own. A deoxidizing treatment should follow degreasing. The deoxidizing treatment must leave the aluminum surface with as low an electrical resistance as possible.

Cleaning for storage not critical

Cleaning for shelf storage may not be as critical as for other specific purposes. Depending on the article and its subsequent use, one of several procedures may be used. Degreasing alone may be satisfactory. Where an etched or frosted finish is desired, degreasing followed by deoxidizing, alkali etching and deoxidizing is indicated. Etching may be done with aqueous solutions of caustic soda, soda ash or trisodium phosphate, with or without other addition agents. Deoxidizing compositions include a variety of acids and acid combinations.

Degreasing may be done using trichlorethylene or perchlorethylene vapors. Even more preferable are the emulsifiable solvents (not emulsion cleaners) with which the work is coated by dipping spraying, brushing, then water rinsing. The water rinse, preferably a spray, removes the oils and greases. Thus, the solvent itself does not recontaminate the work.

Cleaning by shot blasting is chosen for specific effects. Rough castings are often smoothed and deburred simultaneously by this method. Special matte surface effects can also be obtained. Ultrasonic cleaning requires relatively high-cost electrical equipment, but is a particularly good method for mass production cleaning of small units.

A large number of commercial aluminum alloys contain elements which have a bearing on the cleaning materials and methods to be used. Alloys containing manganese, as 3S, develop a manganese smut when etched. The usual nitric acid pickle does not remove this smut well. Other types of pickle baths should be used. Also, alloys containing magnesium have a tendency to form oxide coats when etched in alkali etching solutions. Alloys containing silicon leave a silicon smut when etched. The well known nitric-hydrofluoric pickle is generally used to remove this smut.

Slight passivation of aluminum surfaces prior to certain treatments is sometimes desirable. In plating aluminum, for example, and prior to a zincate dip, it is preferable to modify the highly reactive aluminum surfaces to the alkali action of the zincate bath. Certain types of coatings, resulting in a very thin and uniformly deposited zinc film, make an excellent base for subsequent plating.

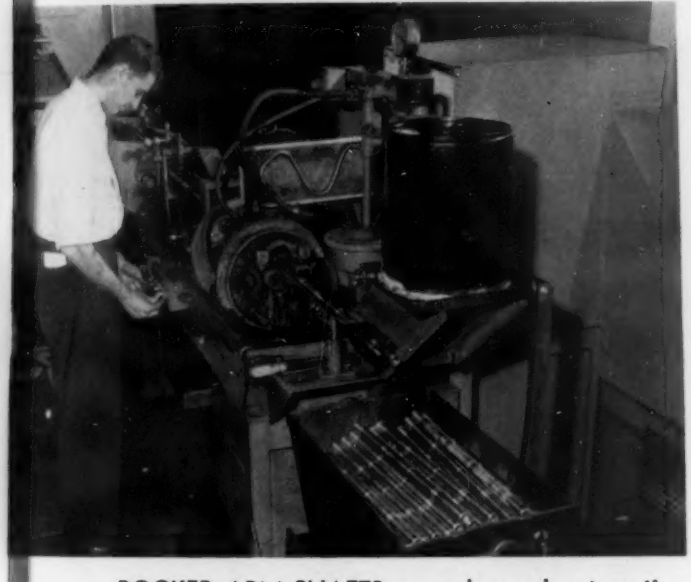
In anodizing aluminum, it is also preferable to have a slightly passivated thin film prior to immersion in a sulfuric acid anodizing bath. The monomolecular film left by an emulsifiable or vapor degreasing solvent serves well for this purpose. Since anodizing is a combination of etching and oxidation, and since the uniformity of oxidation depends on the uniformity of etching, the passivating film helps to produce a uniform etch.

To remove stains, particularly waterstains, from aluminum which has been stored, the procedure is to degrease, deoxidize and etch either in a bright-dip or caustic solution modified to give a bright uniform etch.

The term "clean" may also refer to aluminum, which after fabrication, is finished to eliminate oxidation or dulling due to storage and handling. Anodic oxidation is the first choice here, but a much more economical method involves a one-minute dip in a special acid solution at room temperature to form a conversion coating. This coating, though very thin, withstands up to 2000 hours under standard 20-pct salt-spray tests. It also prevents discoloration by oxidation and handling, and forms an excellent base for paint.

This is the first of a two-part series on surface treatments for aluminum. In next week's issue, Mr. Cohn will discuss in detail the various types of organic and alkaline cleaning compounds as well as deoxidizing and pickling solutions. Chemical and electrolytic brightening will also be covered in Part II.

MAGAZINE feeds valve push rods into cage-like fixture which carries them through induction coils to harden the ball-shaped ends.



ROCKER ARM SHAFTS are advanced automatically from an inclined magazine onto a track. While on track, rollers move shafts axially.

Each has advantages—

Variety in Induction Heating Machines Gives Precise Hardness, Greater Output

By HERBERT CHASE, Consultant
Forest Hills, N. Y.

◆ Induction hardening machines of many makers are used by Chrysler for faster, more efficient processing . . . Some are special-purpose machines, others magazine fed, others fully automatic, and still others are hand fed . . . Each produces exact hardness in a specified area.

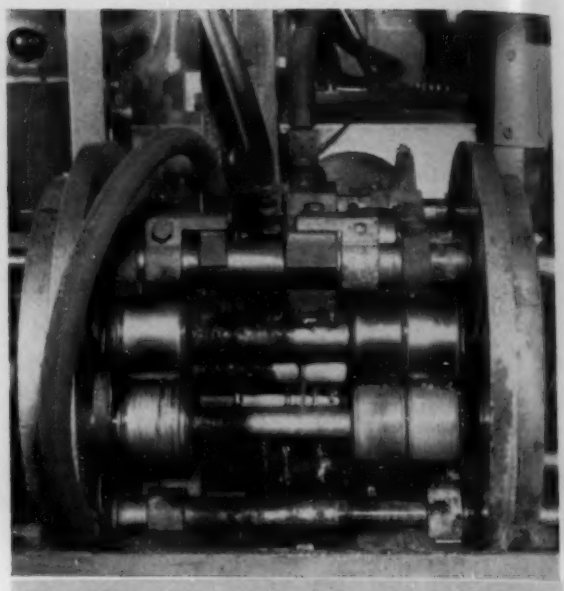
◆ Valve push rods, for example, are fed through induction coils automatically by a cage-like fixture . . . This machine hardens both ends of the rods at the rate of 3600 per hour . . . Shafts for differential pinions are fed by a rocking blade hopper.

◆ MANY MAKES of machines are used by the Chrysler Corp. for induction hardening parts quickly and efficiently. Some are special-purpose machines, some are magazine fed, and others are fully automatic. Still others are hand fed, but are designed for easy and fast handling of parts. In each case, the setup must produce a precise hardness in the area specified.

Induction hardening has the ability to produce hard wear-resistant surfaces with soft tough cores. Fatigue life is increased because of higher surface strength and of the compressive stress introduced into the case, thereby reducing mechanical stress risers. Distortion in heat treatment is also minimized because only small

MR. CHASE, industry consultant and journalist, is well known for his articles on the latest developments in metalworking.

PINION SHAFTS feed from rocker blade hopper through magazine to rollers which carry them through automatically timed heating cycle.



CLOSEUP shows 450,000-cycle induction heating setup for rocker arm shafts. Timer turns current on only when shaft is in the coil.

areas are generally heated by the process.

Rapid processing by induction heating increases production rates and reduces handling. Cost of material is lower because carbon steel rather than alloy steel can often be used. Due to the shorter heating time, there is less scale formation. Another advantage is the considerable saving in space.

Valve push rods made from SAE 1065 steel are among the small parts which are induction hardened. These rods are produced in a screw machine which forms the ball-shaped ends. The ends are given a smoother finish by roller tools that move in an arc from the maximum diameter to the low point of the spherical surface and back to the starting point.

Rods heated uniformly

Only the ball ends are hardened. Rods are advanced through a pair of induction coils by a cage-like fixture which rotates at constant speed. Supporting elements of this fixture are two gear-like disks having evenly spaced notches that fit the rods. These are fed automatically into the notches by an inclined magazine which is loaded manually.

Rods are rotated to attain uniform heating of the ball surfaces as they pass through the heating coils. Continuing around the fixture, rods drop, at required temperature, into the oil quench below. There, they fall onto a wire belt which elevates them as they cool and deposits them into a chute from which they slide into a tote box. Only washing is required to ready them for use.

SAE 1045 steel was tried for the rods but, because some surface cracks resulted from hardening with a water quench, 1065 steel was substituted with an oil quench. No cracks occur and tempering is not needed. Heating is done by a General Electric 450,000-cycle oscillator. Machine output is about 3600 rods per hour. Two duplicate setups are used, one handling intake and one exhaust push rods.

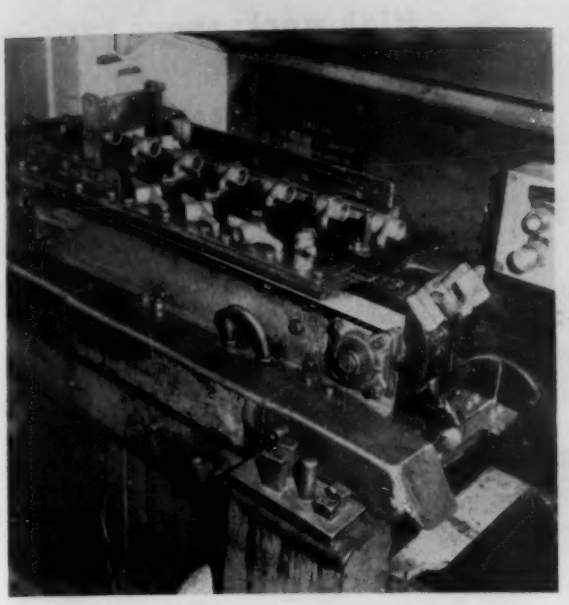
Rocking hopper feeds shafts

Short shafts for differential pinions for all Chrysler cars and trucks are induction hardened in another setup. These shafts are placed in a rocking blade hopper which loads the shafts into a magazine. From the magazine they are fed by rollers, one at a time, through the heating coil of a Budd induction heater operating on a 9600-cycle frequency.

The heating cycle is timed automatically by the feeding mechanism at a rate of about 450 shafts an hour. After heating, the parts are water quenched. A case 0.100 to 0.150 in. deep is produced on the SAE 1050 steel, yielding a hardness of 58 Rc after tempering. Processing is much faster than the carburizing formerly done.

Several other short shafts, including one for brake pedals, are hardened in similar hopper-fed setups, heated by a 20-kw Westinghouse unit. A spider-like fixture is used and can be changed quickly if the shaft size is changed. Where different lengths of shafts of the same diameter are handled, brass spacers are used to compensate for the difference in length. Average time per piece is slightly more than one second.

Hollow rocker arm shafts for Dodge engines are case hardened in another setup after they are deburred inside by blasting. They are placed in an inclined magazine by hand and fed auto-



CHAIN CONVEYOR equipped with special fixtures carries valve rockers through heating cycle. One end of valve passes through slot in coil.

INDEXING TABLE with water-cooled fixtures moves valve rockers to heating station at rear of dial. Machine hardens four rockers in 23 sec.

matically onto a track. While on the track, the shafts rest on driven rollers which advance the shafts axially, one at a time, into the heat-treating fixture.

In the fixture, the shaft rotates continuously inside an induction heating coil powered by a 450,000-cycle, 50 kw unit. Current is turned on and off by a rotary timer, being on only when the shaft is in the coil. Ejection and reloading occur automatically. Water quenching follows heating, after which the hardened shaft is pushed along the track by the incoming shaft. Hardening of each shaft takes 17 seconds. No scale is formed and the case is uniform.

Valve rockers for Dodge engines are of pearlitic malleable iron and require hardened end surfaces to resist wear. One setup for this work has a 9600-cycle Westinghouse induction heater with two four-place fixtures which are used alternately. While one is loaded, the other does the heating.

Four rockers hardened in 22 sec

Rockers are put in place by hand and locked by hand toggles with the end to be hardened in a coil recess. When the four parts are locked in place, the operator presses a button to start heating. After a preset interval, the fixture is unlocked and retracted, causing the parts to drop into a quench below. While this takes place, the operator reloads the second fixture which goes through a duplicate cycle. In this way, both ends of four rockers are hardened in 22 seconds.

In another setup, a similar job is done on a 50-kw Thermonic induction heater using a set of fixtures mounted on a chain conveyor. Four rockers are loaded by hand on four fixtures. As the fixtures are advanced by the chain, the ends to be heated pass through a slot in the heating coil where they are raised to quenching temperature. Beyond the coil, the rocker is pushed from the fixture into a quench.

Both ends of intake valve rockers are heated and then hardened at the same time in the indexing setup. This permits each of three water-cooled fixtures to be loaded, one at a time, with four rockers.

Air indexing used

Each rocker is slipped over a pin and is pressed against a stop. This positions both ends of each rocker so that they enter one of the eight heating station coils at the back of the dial. At the heating station, a plate holding the eight heating coils is rocked downward by an air plunger. This brings the coils into position so that one coil heats one end of each rocker.

When heating is completed, the coils are automatically retracted. The fixture holding the rockers is air indexed and all four rockers are stripped off the pins and dropped into a quench. This setup hardens both ends of four rockers in 23 seconds.

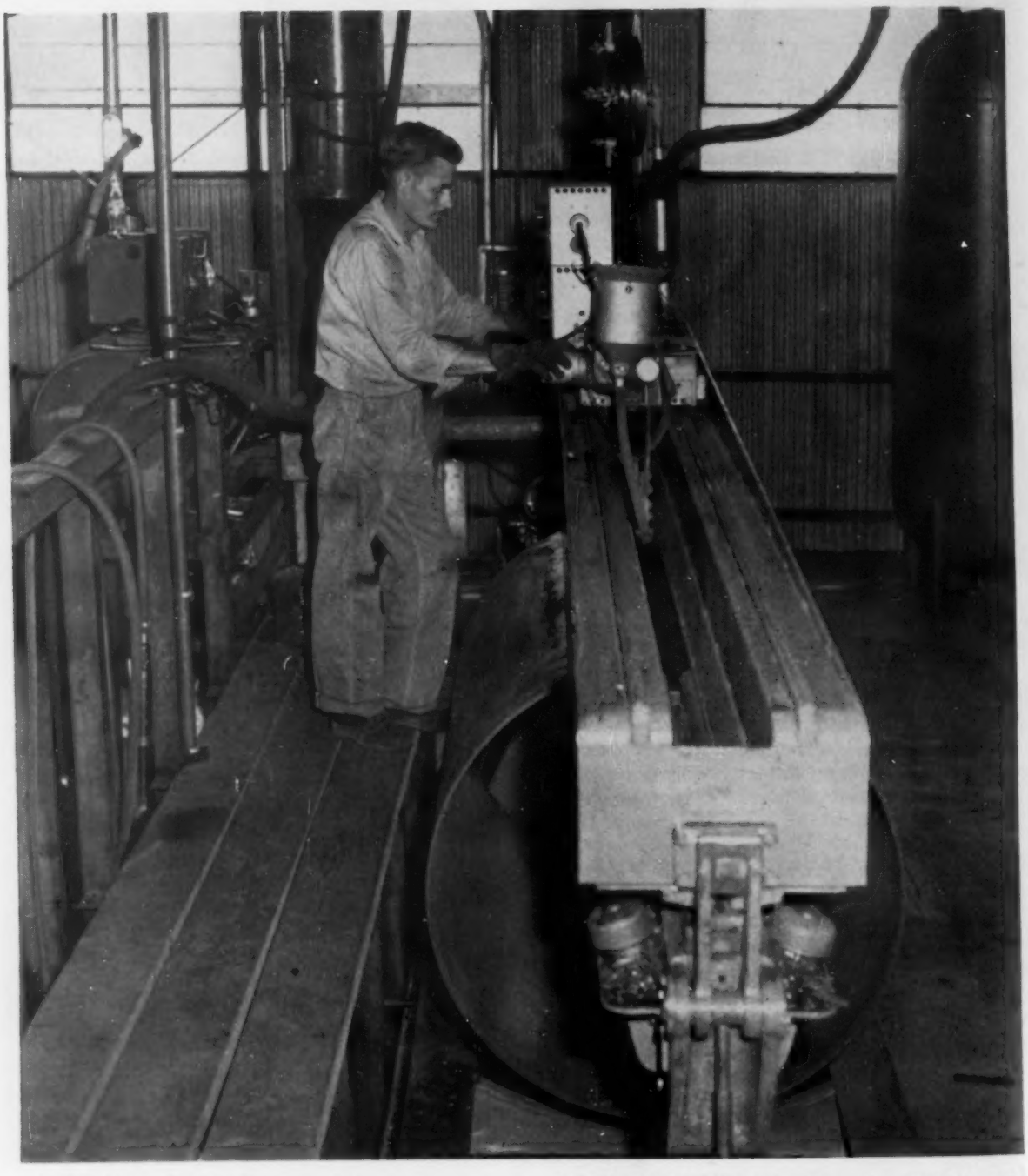
Largest of the parts induction heated by Chrysler are the rear axles for cars and trucks. The shafts are SAE 1037 steel which has been previously forged to shape, rough machined and partly finish machined. Each of the induction heating machines used for this work is powered by a 4800-v generator, accommodates six shafts, and has a 50-kw capacity per shaft.

At the outer end of each shaft is a taper which fits the wheel hub. A keyway is cut in this area after it has been case hardened and tempered to 41 to 47 Rc to a minimum depth of 0.160 in.

High work: space ratio—

Automatic Welding, Good Handling Speed Tank Production

◆Automatic welding teamed with good materials handling enables only 29 men to produce 20, 500-gal and 1000-gal LPG tanks per 8-hour day . . . Shop layout is compact, reducing manual handling to a minimum . . . Each tank must pass hydrostatic test at 400 psi.



BY GENE SCROGGS, Plant Superintendent, Delta Tank Mfg. Co., Beardstown, Ill.

AFTER SHEARING and rolling, the 11/32-in. thick plate is seam welded at 31 ipm. A single pass achieves full penetration.

◆ ASSEMBLY of liquefied petroleum gas (LPG) tanks by welding is not in itself a complicated job. On the contrary, automatic welding methods and good shop layout can cut handling to a minimum, speed production considerably and reduce production costs by a wide margin. This has been the experience of Delta Tank Mfg. Co. in its Beardstown, Ill., plant.

In its compact 24,000 sq ft building, the production line receives sheet steel at one end. Only 400 ft away, finished 500-gal and 1000-gal tanks flow out at the rate of 20 per 8-hour day with only 29 employees. All tanks are coded for LPG use and are rigidly inspected as to weld quality. Every tank is tested hydrostatically at 400 psi.

Almost all welding is done with six automatic Unionmelt heads. Open arc welding is used only for tack welding the tank bodies and for affixing the saddle supports. The plant has 14 operators for welding and one for manual flame cutting.

Plate for the tank bodies, 11/32 in. thick, is sheared on three edges to size, then rolled to cylinder shape in one pass in a Webb roller. The edges to be welded are butted together and held in the roller while they are tack welded in four places.

An automatic welding head on a special Reed machine makes the longitudinal welds in the tank bodies. Rod used for this seam is 3/16 in. diam Oxweld No. 29. Welding is done at 650 amp dc. Speed is 31 ipm and full penetration is achieved throughout the weld. Hold-down and backup bars are of copper.

Manual flame cutting is performed in the next operation in making an "island bar" hole. The "island bar" is a 1-in. thick plate which is threaded to take the relief valve, filler valve, vapor return, an outage valve, pressure gage and float gages.

After flame cutting and tack welding the "island bar" in place, a second automatic head makes a contour weld between the body and the "island bar." To accomplish this, the head is mounted on a cutting machine equipped with a templet tracer. Two weld passes are made at the rate of 30 ipm. Backup at this station is a flux box arranged to fit snugly under the weld area as welding takes place.

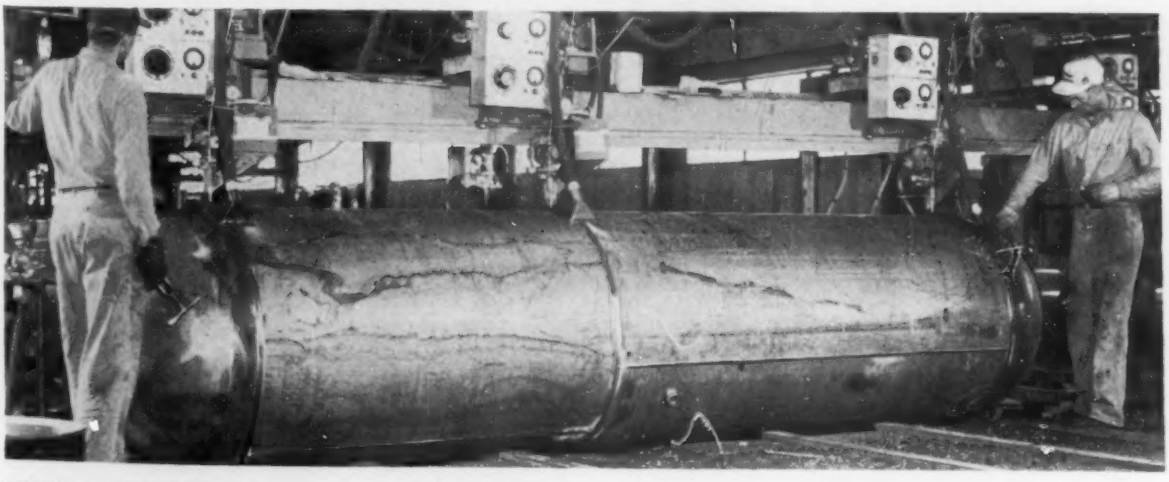
On a standard offset rolling machine, offsets are then rolled at both ends of 500-gal tank bodies and on only one end of 1000-gal tank bodies. The offsets prepare the body ends so that they fit inside the edge of the 0.231-in. thick dished heads. At the next station, the dished heads are assembled to the tank bodies and tack welded.

Three automatic welding heads are mounted on the next large machine. The heads remain stationary as the tanks revolve on sets of motor-driven rollers. The beam which holds the welding heads has a track on which it is possible to position the heads at any location above the tank. The beam can also be raised and lowered to accommodate tanks of larger or smaller diameter.

In making the circumferential welds, the rod, melt, current, and speed are the same as for the longitudinal welds. Two complete passes are made without the use of any backup. It takes 7 min to complete the three welds in 1000-gal tanks having a diameter of 41 in.

A weld test coupon is cut out of every 50 linear feet of welding after the circumferential welds are completed. The coupons are either etched and examined or X-rayed.

Saddles or stands are next arcwelded to the tank bottoms, after which the tanks undergo hydraulic testing. In all steps following, the tanks move by gravity on a monorail conveyor. Finishing steps include affixing the dome, then the name plates, valves and other components, passing through a dehydrator at 350°F to drive out water, and finally spray painting.



DISHED HEADS and center circumferential seam are welded simultaneously with this three-head automatic welder. The job takes 7 minutes.

Creep-rupture tests—

Statistical Study of Properties Proves Aid In Part Design

◆ The statistical approach to materials testing offers a valuable guide in accurately evaluating the inherent variability in the properties of metals . . . Its application may permit wider latitude in design, especially where "average" material properties or incomplete knowledge of material properties have required "conservative" design.

◆ Here the method has been successfully applied to the study of creep-rupture properties of as-Cast Stellite 31 . . . Design information presented is based on data from 96 specimens . . . Temperature is the most critical of the controllable variables—temperature, stress and time, the creep-rupture studies showed.

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◆ STATISTICAL METHODS, as applied to quality control of raw materials and manufacturing processes, are widely accepted and have often resulted in improved products. The statistical nature of certain mechanical properties of materials and the importance of determining the variance in these properties is, unfortunately, not well recognized. A trend, however, is developing toward statistical interpretation in experimental investigations. This is especially true of fatigue testing.

Despite present accuracy and reliability attained in creep-rupture testing, an inherent variability of the properties of materials exists and must be evaluated in the determination of design properties. This variance in material properties is dependent upon such factors as composition, microstructure, hardness, inclu-

DEFINITIONS OF STATISTICAL TERMS

TOTAL POPULATION: Infinitely large number of specimens from which random sample is drawn.

CONFIDENCE ENVELOPE: An hour-glass shaped area surrounding the cumulative distribution curve within which the true distribution lies with a given probability.

TRUE DISTRIBUTION: The infinitely large group of data representing the total population.

CUMULATIVE DISTRIBUTION CURVE: The percentage of samples falling on and below a given test value plotted against the value, on a cumulative basis, on standard probability paper.

STANDARD DEVIATION: (σ): A measure of the spread of individual values about the average. Defined mathematically as,

$$\sigma = \sqrt{\frac{\Sigma (X_i - \overline{X})^2}{n}}$$

where X is the average value, X_i the individual measurements, and n the total number of values.

PROBABILITY LEVEL: Chosen degree of certainty which determines limits of confidence envelope.

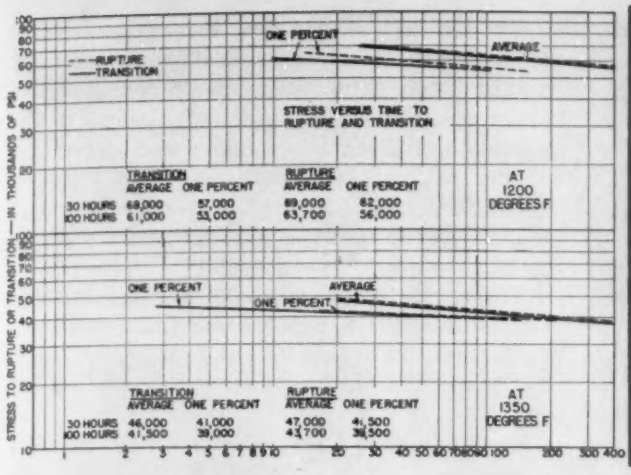


FIG. 1—Stress versus time to rupture and transition at 1200° and 1350°F.

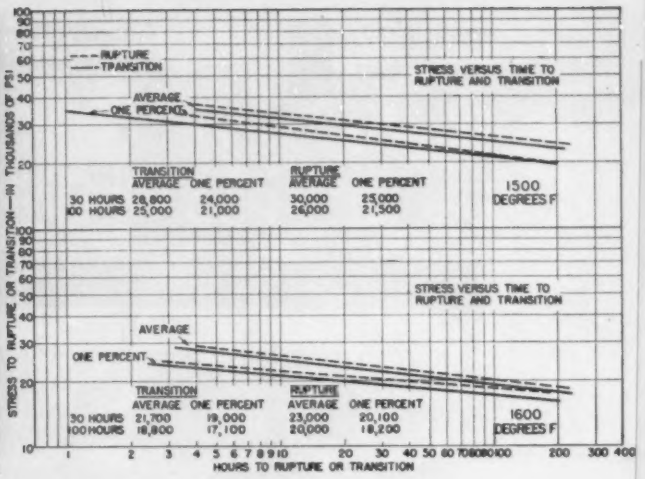


FIG. 2—Stress versus time to rupture and transition at 1500° and 1600°F.

sions, and surface conditions. In view of this material variability the creep-rupture properties of (as cast) Stellite 31 have been statistically investigated.

Material variations, unless correctly evaluated, cause either a premature service failure of parts or result in a conservative design when using average material properties as the design criterion unless correctly-chosen safety factors are incorporated.

A statistical approach can eliminate at least that part of the safety factor that must be assumed due to incomplete knowledge of material properties and their variability. The statistical interpretation of test results predicts the degree of variability to be expected in a total population obtained by appropriate sampling. This prediction must be made from test data representing only a finite sample of the total population.

Statistical analysis provided a rather simple, yet widely recognized, method of describing variations and establishing confidence limits. For most engineering problems, a graphical solution is sufficiently accurate. Using the graphical approach, the test data on Stellite 31 (as cast) was analyzed by first obtaining the cumulative distribution curves, using standard logarithmic probability paper, for each temperature and stress level of testing.

From these distribution curves the lower limits of the confidence envelopes were established at the 0.75 probability level and extended to the cumulative 1 pct ordinate. The corresponding values established by this confidence limit at 1 pct are the minimum values that can be expected, in 99 out of 100 tests, at the arbitrarily chosen 0.75 probability level. If a higher probability level is desired, the confidence envelope will be correspondingly widened.

In this way, the statistical minimum values of rupture and transition time and elongation

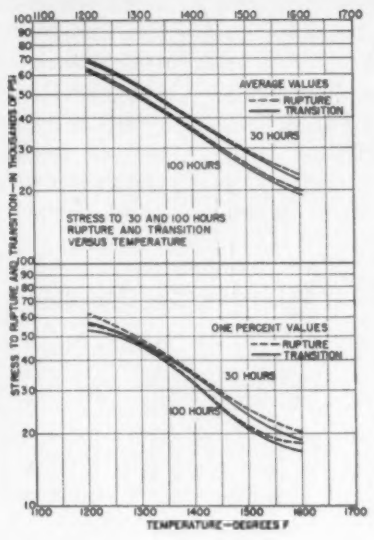


FIG. 3—Stress to 30 and 100-hour rupture and transition versus temperature.

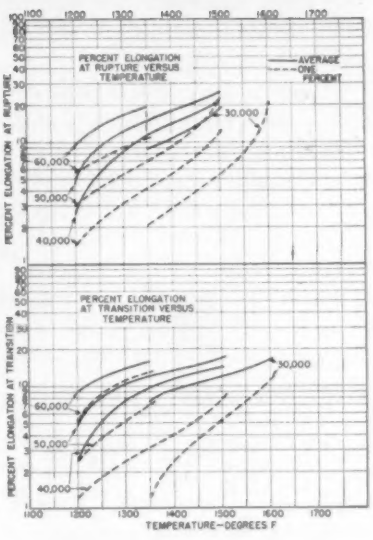


FIG. 4—Percent elongation at rupture and transition versus temperature.

TABLE I **Temperatures and Stress Levels**

1200°F	1350°F	1500°F	1600°F
55,000 psi	40,000 psi	24,000 psi	19,500 psi
60,500 psi	42,000 psi	30,000 psi	22,000 psi
66,000 psi	46,000 psi	34,000 psi	24,000 psi

at a given probability level were determined for design purposes. Average values were calculated and compared with statistical results over a temperature range of 1200° to 1600°F.

The specimens used were precision cast. The standard specimens were 0.252 in. in diam and 1½ in. long. The design information presented is the result of the evaluation of data from 96 specimens tested in Baldwin screw-type creep-rupture machines. Eight specimens were tested at each stress and temperature as indicated in Table I. Three heats were tested at each temperature. Analyses of heats, compared with the specification analysis, are shown in Table II.

The results are based on a statistical evaluation using (N-3) as a factor in the determination of the standard deviation and the error in the standard deviation for samples of less than 10 specimens.

Figs. 1 and 2 compare the average and statistical 1 pct minimum values of times to rupture and transition at four test temperatures. These curves clearly show the importance of determining statistical minimum values for the transition stress and the rupture stress rather than relying on average values.

For example, at the 100-hour level, in all cases the statistical minimum values of stress are at least 5 pct lower than average values, and in most cases, more than 10 pct lower. In addition, a comparison based only on average values tends to conceal the narrow margin existing between rupture and transition from a standpoint of time, stress and temperature. The 1 pct minimum curves emphasize this narrow margin, particularly at longer times in the 1350° to 1500°F range.

Stress to 30 and 100-hour rupture and transition versus temperature is shown in Fig. 3. The difference between rupture and transition from a temperature standpoint varies from one or two degrees to about 40°F for 1 pct minimum values.

Thus in the 1350° to 1500°F range at stresses from 20,000 to 40,000 psi, it is statistically possible for either transition or rupture to occur on a given sample in approximately 100 hours for a given temperature and stress. At higher or lower temperatures, an increase of only 40°F or less at constant stress could mean the difference between rupture and transition within the same time period.

To provide a comparison of average and statistical ductilities, rupture and transition elongation results are plotted at constant stress in Fig 4. Margin of growth between transition and rupture may be found from these curves.

The statistical 1 pct minirum values indicate a variation in the ratio of rupture elongation to transition elongation depending on the stress and temperature. This ratio ranges from a value of slightly more than one to as high as two under different test conditions.

At the stress and temperature combinations presented in Fig. 4, both transition and rupture elongations increase with stress at a given temperature and with temperature at a constant stress. However, at low stresses (on the order of 20,000 psi), resulting in longer times to rupture and transition, elongation values were found to be low, even at high temperatures, due to the effect of aging on Stellite 31. Depending on the time and temperatures involved, the elongation may actually decrease with increasing temperature due to the increased rate of aging.

The importance of a statistical evaluation is even more clearly shown in Fig. 4 than in Figs. 1 and 2. A comparison of these figures shows a much wider range in the true distribution of elongation values than of time or stress values. This is evident from the greater relative differences between average and 1 pct minimum elongation results. In some cases, the 1 pct minimum elongation is less than one-fourth of the average value.

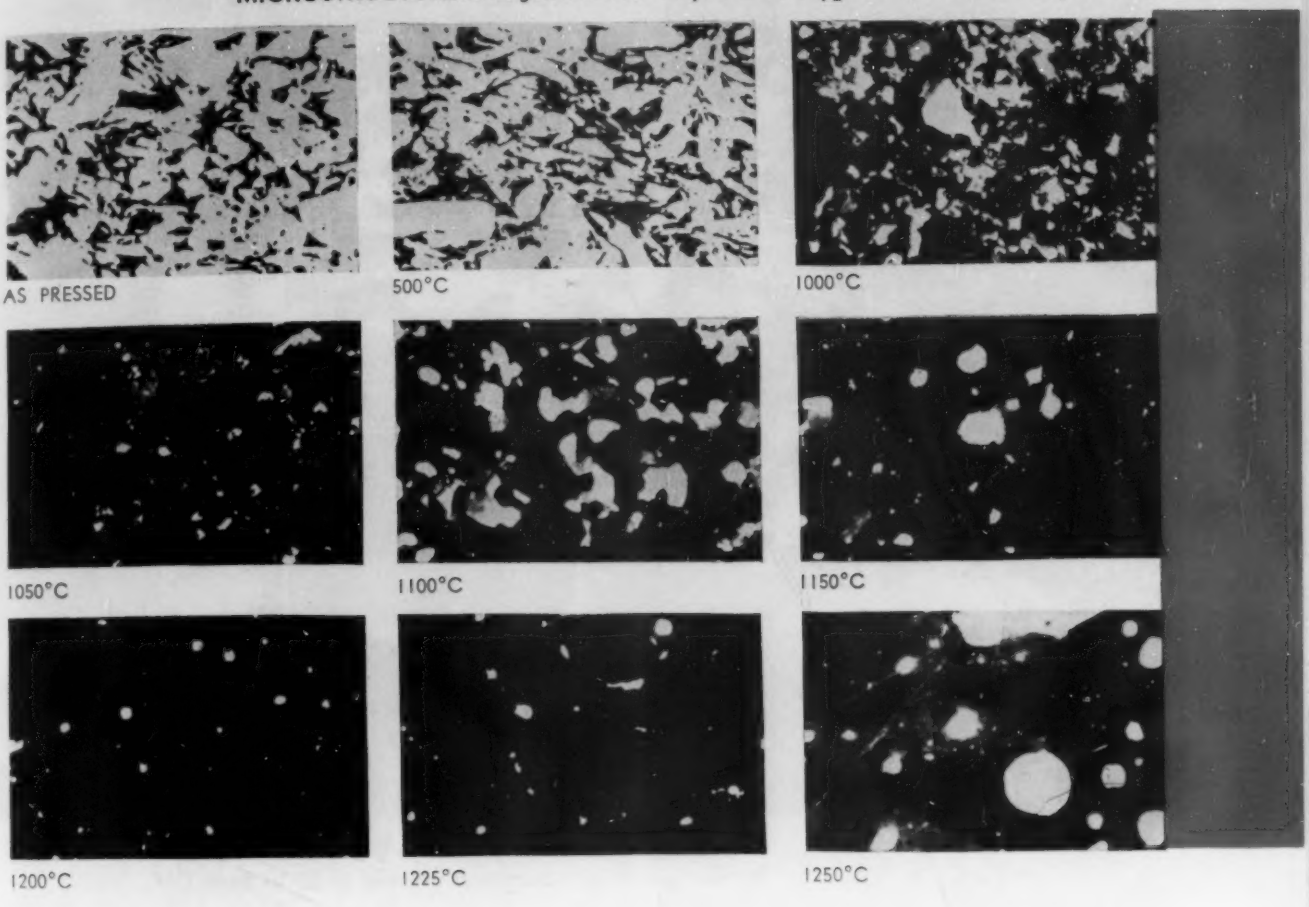
A statistical approach to creep-rupture data in this investigation has shown that only on the basis of time as a measurement between transition and rupture is there any appreciable margin between the two values. The difference between these values, considered from a temperature standpoint, is small over the complete testing range, indicating that temperature is the most critical of the three controllable variables (temperature, stress and time.)

TABLE II **Analyses of Heats vs. Specification**

HEAT NO.	CR	W	FE	C	SI	NI	MN	MO	CO	P	S
97	25.18	7.61	1.40	0.52	0.75	10.60	0.65	0.42	Bal	0.014	0.015
208	26.10	7.30	1.30	0.47	0.64	10.00	0.60	0.42	Bal	0.010	0.012
312	25.13	7.44	1.30	0.45	0.68	10.76	0.52	....	Bal	0.012	0.010
Spec.	24.5–26.5	7.0–8.0	2.0*	0.45–0.55	1.0*	9.5–11.5	1.0*	....	Bal	0.04*	0.04*

* Maximum permission percentage.

MICROSTRUCTURE of argon sintered beryllium after ½ hour at various temps. 250X.



By powder metallurgy—

How to Fabricate ZIRCONIUM AND BERYLLIUM

◆ Powder metallurgy methods of processing zirconium and beryllium parts are a means of overcoming many of the difficulties of conventional fabrication . . . Zirconium achieves full density at relatively low temperatures.

◆ Beryllium, even at temperatures close to melting, is not completely dense . . . Sintered beryllium compacts can be cold reduced up to 10 pct . . . Annealing softens cold reduced beryllium.

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◆ INCREASING USE of beryllium and zirconium and their alloys has stimulated interest in their fabricating properties. Zirconium has been used in radio tubes, photoflash lamps and flares. Beryllium has been used in x-ray tubes and in lightweight alloys. Both metals show promise as moderators in nuclear reactors and have good corrosion-resistance properties. Beryllium has a higher strength-to-weight ratio than aluminum, magnesium, titanium or stainless steel.

Conventional melting and casting of beryllium and zirconium requires special crucibles and protective atmospheres. Powder metallurgy offers a practical way of fabricating these metals. Since zirconium and beryllium

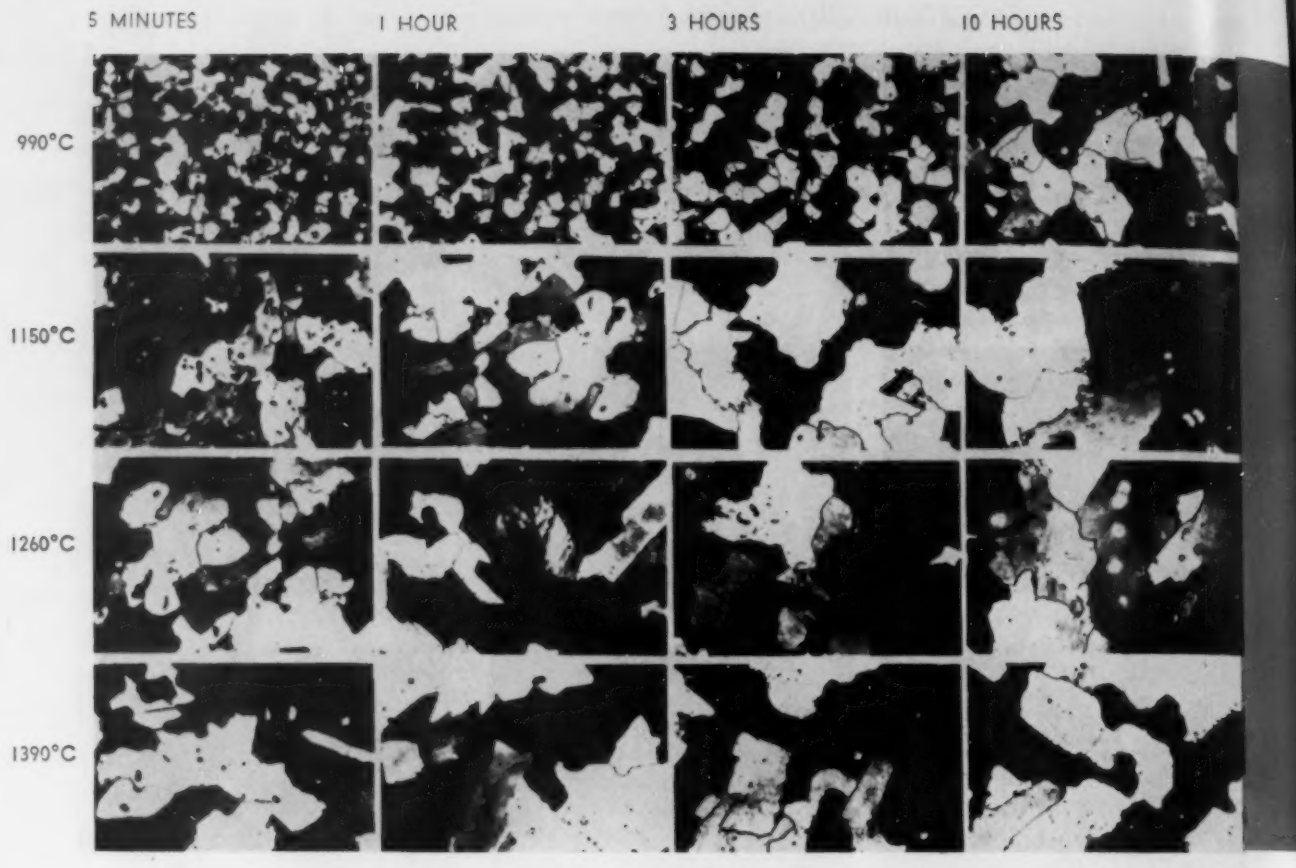


FIG. 2—Grain growth of vacuum sintered zirconium compacts pressed at 50 tsi from ZrH_2. 250X.

do not behave alike during sintering, the processing of powdered material to a dense sintered product does not follow the same pattern.

Zirconium is inherently ductile, while beryllium is generally very brittle. Both, however, have a close-packed hexagonal structure. Each reacts with or absorbs oxygen rapidly at high temperatures, even where traces of oxygen exist in high vacua.

Zirconium sponge and crystal bar are too ductile at room temperature for mechanical pulverizing. Zirconium hydride (ZrH_2), however is brittle and, as a powder, can be easily decomposed in vacuum.

Temperature control critical

The hydride forms between 235° and 800°C. At about 400°C hydrogen is absorbed at its highest rate as it goes into solid solution or forms the hydride or both. By heating the zirconium in hydrogen either at 400° or 800°C and then cooling in hydrogen, ZrH_2, ZrH or a mixture of both is obtained. The friable hydride pieces can then be ground by hand in a steel mortar to a 400 mesh if necessary.

Zirconium metal powders can then be prepared by decomposing the hydride powders at 800°C or above in a high vacuum. A slow rate of heating, fast pumping speed, and control of temperature at about 800°C are rather critical if hydrogen is to be removed to a few hundredths of a per cent and an easily pulverized sinter cake is desired.

Zirconium powder or zirconium hydride powder will compact without a binder and the compression ratio is low for both, 2:1 to 2.5:1 at 40 to 50 tsi. Since the compression ratio determines the type of the compacting die, this characteristic is advantageous in die design.

The hydride can be compacted at lower pressures than the zirconium powder. At about 90 tsi, where (as-pressed) density approaches a maximum, compacted zirconium powder reaches about 5.9 g/cc and zirconium hydride, about 5.2 g/cc.

Zirconium should be sintered either in a very pure inert gas or in a high vacuum. Small traces of nitrogen in purified argon are readily picked up by the zirconium powder; however, vacuum sintering at 5×10^{-5} mm of Hg and at about 1300°C can be carried out without notable increase of oxygen content. Vacuum sintering can also be used to advantage with zirconium hydride powder since decomposition occurs simultaneously with sintering. When the hydride powder is sintered in argon, residual hydrogen content is high compared with the original crystal bar.

When the hydride is sintered in covered graphite boats are separated by graphite slabs the zirconium has an excellent surface appear-

ance and is free from contamination. The sintered product of compacted zirconium hydride powder is superior in most respects to that of zirconium powder. Ductility, corrosion resistance, and gas content are more favorable because of lower oxygen and nitrogen contents.

Compacted zirconium hydride sinters readily to full density and compacts at lower pressures than zirconium powder. The green strength of compacted hydride powder is sufficient for easy handling.

Hot-pressed zirconium powder compacts have a uniform fine grain size slightly less than that of cold-pressed and sintered specimens of similar density. Hardness is also slightly higher. A typical condition for hot-pressing in a graphite-lined steel die is 25 tsi for 15 minutes at 650°C.

The table shows the effect of compacting pressure, sintering time, and sintering temperatures on the density of zirconium. Specimens were made from —325 mesh zirconium hydride.

Ideal density can be attained, by sintering 1 hour at 1150°C using compacting pressure of 75 tsi. Fig. 1 shows a plot of isodense lines after sintering in the specified time and temperature for compacts pressed at 50 tsi. From this the density obtainable for any given sintering temperature and time can be predicted.

If a sample is to be sintered to ideal density for 8 hours at 1250°C, compacting pressures as low as 35 tsi can be used. If the temperature must be low, higher pressures are necessary. At 1100°C a sample compacted at 75 tsi can be sintered for as little as 3 hours to attain ideal density.

Grain growth of zirconium during sintering is very rapid when zirconium hydride is the starting material. Grain size of zirconium, sintered at various times and temperatures, is shown in Fig. 2. Grain growth apparently is most rapid between 1100° and 1200°C. Densification, however, is relatively rapid at lower temperatures. Toward the end of sintering, density approaches ideal, little densification occurs, but grain growth is quite rapid.

Hardness influenced by oxygen

The hardness of sintered zirconium may be influenced by oxygen content, grain size, and density. The first two factors affect the intrinsic properties of the metal, but the hardness when affected by density merely indicates the amount of porosity.

The hardness of dense, sintered zirconium pressed at 75 tsi varies from 90 to 94 RB. This variation may be due to the spread in grain size and oxygen content. Lower hardness is probably associated with grain growth; higher hardness with oxygen content due to sintering at higher temperatures or longer times.

Optimum properties appear to be obtained with compacting pressures of 40 to 50 tsi when the hydride compacts are sintered in graphite

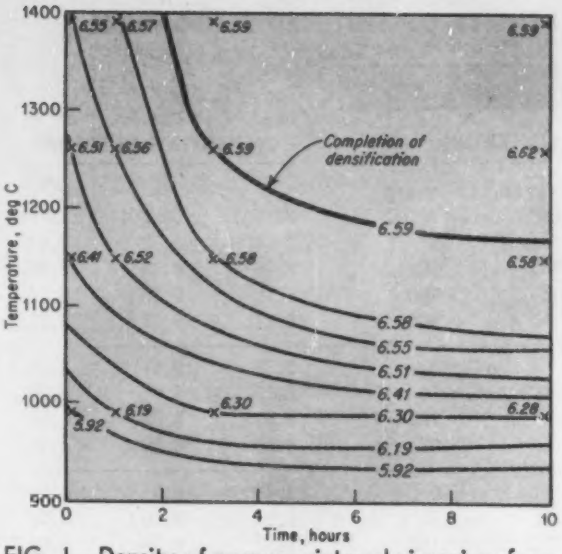
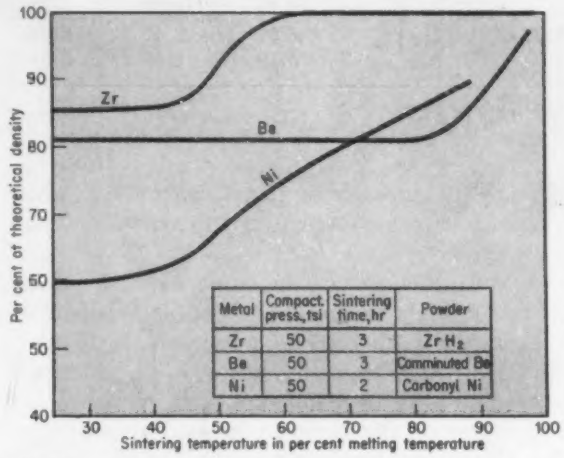


FIG. 1—Density of vacuum sintered zirconium from —325 mesh ZrH_2 powder compacted at 50 tsi.


Per cent of theoretical density
Sintering temperature in per cent melting temperature
Zr
Be
Ni
Metal | Compact. press., tsi | Sintering time, hr | Powder
Zr | 50 | 3 | Zr H2
Be | 50 | 3 | Comminuted Be
Ni | 50 | 2 | Carbonyl Ni

HOW zirconium, beryllium and nickel powders differ in density after sintering as indicated.

boats in vacuum between 1150° to 1260°C. Such conditions give sintered compacts of practically theoretical density and of appreciable ductility.

Beryllium powder is produced from vacuum-cast billets by lathe chipping the billets then mechanically powdering in rolling and attrition mills. Chipping and milling are done in a protective atmosphere with safety precautions because of beryllium powder's high toxicity. The powder frequently contains nonmetallic impurities. The BeO content, about 0.15 to 0.20 pct in vacuum cast billets, is raised during grinding to about 1.5 pct. For small particles the percentage is higher, and may increase when the beryllium powder is stored in sealed containers.

Beryllium powder can be compacted in a steel die, in a hydraulic press at about 15 to 90 tsi. Powder particles do not adhere satisfactorily below about 10 tsi. Lamination does not occur, even up to 90 tsi. The as-pressed density increases almost linearly with com-

DENSITY OF SINTERED ZIRCONIUM*

SINTERING		COMPACTING PRESSURE		
TEMP., DEG. C	TIME, MIN.	35 TSI	50 TSI	75 TSI
	5	5.89	5.92	6.07
900	60	6.06	6.19	6.16
	180	6.12	6.30	6.27
	600	6.21	6.29	6.31
	5	6.33	6.41	6.52
1150	60	6.48	6.52	6.58
	180	6.53	6.58	6.59
	600	6.59	6.58	6.59
	5	6.46	6.51	6.59
	60	6.54	6.56	6.58
1260	180	6.57	6.59	6.60
	600	6.62	6.62	6.60
	5	6.51	6.55	6.59
	60	6.55	6.57	6.59
1390	180	6.58	6.59	6.60
	600	6.59	6.59	6.63

* Density in g/cc.

pacting pressure up to 70 tsi, where it reaches about 1.55 g/cc. At 90 tsi, density is about 1.59 g/cc.

Beryllium sintering must be carried out at a fairly high temperature because densification does not start up to approximately 1000°C. Sintering can be done either in a protected atmosphere or in a vacuum, and the physical properties of the compact depend strongly on the sintering atmosphere.

Vacuum sintering results in higher densities than sintering in purified argon under similar temperature conditions. In addition a great difference in the effect of compacting pressure on the sintering densities can be observed as a function of the sintering atmosphere.

The densities of vacuum-sintered specimens are practically independent of the compacting pressures, whereas a strong dependency can be observed for those sintered in argon.

During vacuum sintering beryllium shows a high rate of evaporation, accompanied by a considerable weight loss of the beryllium compact. During sintering in a vacuum at 1200°C for 3 hours, weight losses between 20 and 50 pct were observed, depending on the surface-to-volume ratio of the compact. At 1200°C the vapor pressure of beryllium is about 10 microns of Hg. No weight loss is observed after sintering in argon atmosphere.

Beryllium powder, compacted at room temperature and sintered in vacuo or in an atmosphere, does not result in a compact of theoretical density (1.86 g/cc), even when compacted at high pressures and sintered at temperatures close to the melting point of the metal.

The incomplete densification and the fairly late start of densification may be due to the low self-diffusion of beryllium, but can be explained also by the fact that the commercial beryllium powders generally used contain approximately 2 pct or more beryllium oxide and other impurities which hinder densification. Pure beryllium powder is not readily available since the oxide will form even in high vacuum.

Recrystallization of beryllium during sintering seems to start earlier than densification. Microstructure of beryllium sintered in argon at various temperatures is shown on p. 123. When sintered at 1000°C, recrystallization has already occurred. Grain growth can be observed from the structures, as obtained by sintering at 1050°C and above. In a vacuum, the rate of grain growth seems to be slightly less than during argon sintering. From many experimental data, one may draw the conclusion that an increased amount of crystal nuclei are formed during vacuum sintering, which could explain the smaller grains. The grains are practically equi-axed in both vacuum and argon-sintered beryllium.

In vacuum-sintered beryllium, the solid impurities (mostly BeO) are arranged exclusively in the grain boundaries, whereas argon-sintered samples frequently showed some of the solid impurities within the grains.

Beryllium is brittle. Some fabrication methods, however, such as extrusion, result in a certain pseudo-ductility in direction of extrusion, probably due to a fibrous structure which is characteristic of extruded materials.

Argon-sintered beryllium is quite brittle. However, vacuum-sintered beryllium shows some ductility, although this material has no fibre structure, but equi-axed grains. Vacuum-sintered beryllium can be cold rolled up to 10 pct decrease in thickness without showing any signs of edge cracking. Twin formation occurs during cold rolling and the amount corresponds to the degree of cold working. Very little effect of annealing for ½ hour can be observed at 600°C, whereas at 700°C, the twins disappear rapidly, the structure rearranges, and at 1000°C, all twins disappear. The annealed material can be cold rolled again.

Warm pressing yields dense compacts

Most beryllium in use is made by hot pressing, a simultaneous compacting and sintering. Pressures between 500 and 1000 psi, at temperature between 900° and 1125°C have been used. Densities obtained during hot pressing are, in some cases, slightly higher than theoretical densities because sintered beryllium contains a certain amount of the more dense beryllium oxide. Dense beryllium compacts of very high strength can also be produced by "warm pressing" commercial grade beryllium powder below the recrystallization temperature.

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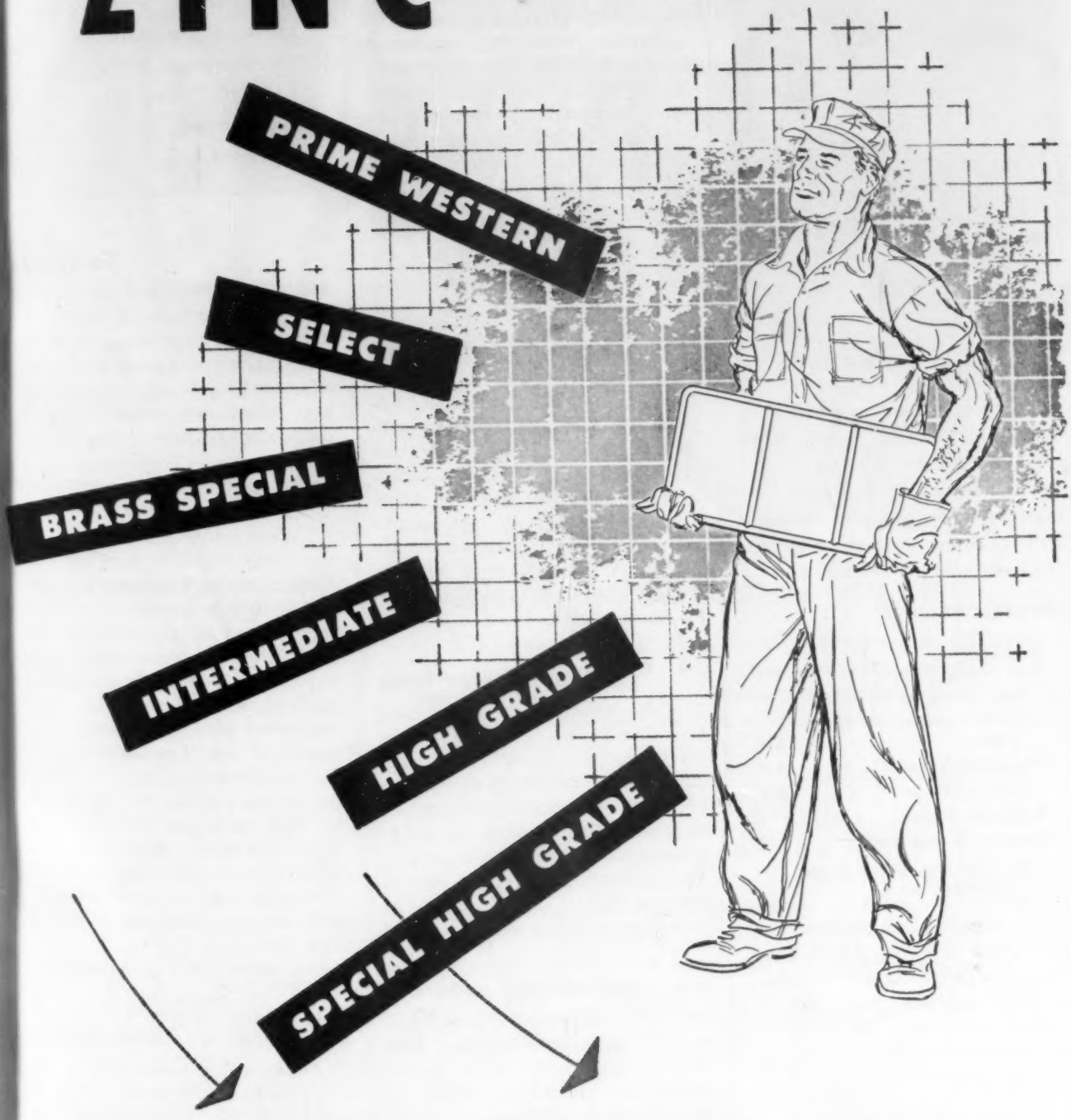

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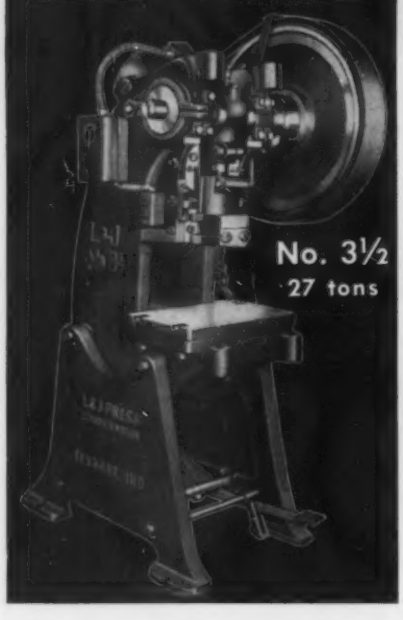

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New attachment

A dual-purpose attachment for use with Lewis-Shepard SpaceMaster Electric Fork Trucks is announced in this new folder. This attachment handles wooden barrels and steel or fibre drums through clamping pressure, and also dumps their contents by hydraulic tilting action. All of the operations, including clamping, rotating, lifting, lowering and tilting, are controlled by the operator in the cab. *Lewis-Shepard Products, Inc.*

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Brass nuts

"Fischer Turned" brass nuts are the subject of this new booklet. Advantages include increased efficiency of nutsetters, every nut burrless, and both sides countersunk. Special and odd size brass nuts are covered. Tables, charts and drawings give additional information. Specifications are included. *Fischer Special Mfg. Co.*

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Portable power tools

A wide variety of portable power tools such as electric hammers, electric saws, electric drills, etc. are described in this 26-page catalog. It contains helpful specifications such as drilling capacity and power consumption as well as many others. Tool attachments are also shown. *Syntron Co.*

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Refractory concrete

Refractory concrete is discussed in this new manual. Refractory concrete is used in the metal, power, ceramic and petroleum refining industries. Basic information on recommended practice for mixing and placing refractory concrete and special aggregates is given. Charts and tables give technical data. *Lumnite Div., Universal Atlas Cement Co.*

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Fasteners

Hassall fasteners are the topic of this new brochure. Complete information is given on special rivets, nails, screws and small parts manufactured by the cold heading process. Advantages are listed. Specifications are included. *John Hassall, Inc.*

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Castings

Modern casting impregnation is discussed in this new brochure. How this method achieves complete impregnation of porous castings is illustrated. The equipment used in batch immersion for the rapid treatment of large quantities of parts is shown. Application to various metals is described. How impregnation reduces product rejects in both cast and metal powder parts is shown. Tables give the properties of the New Metalseal impregnant, and the corrosives it will resist. *American Metalseal Mfg. Corp.*

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Press control

The Hagan ring balance meter for 2000 psi hydraulic press control is covered in this new bulletin. The bulletin explains how the meter measures the water level directly rather than using the air pressure method. The advantages of the meter are described. The design is shown. *Hagan Corp.*

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Catalogs & Bulletins

Wire rope assemblies

Macwhyte Safe-Lock wire rope assemblies are discussed in this new booklet. They are a unit of flexible wire rope with permanently attached fittings of various types and sizes to make a complete operating flexible unit. Bright and galvanized carbon steel, stainless steel and monel metal are used for the wire rope. *Macwhyte Co.*

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Gear checkers

Sine-Line Involute Gear Checkers are described in this 4-page bulletin. Based on the sine-line principle, the machines are capable of checking the involute form on helical and spur gears up to 36 inches in diameter. Construction features of the line are pointed out and operating details described. Listed also are specifications for the entire 14-model line. *Michigan Tool Co.*

For free copy circle No. 9 on postcard, p. 132A

Control unit

The Brown Electr-O-Vane Control Unit is an electronic control switch. Data sheet describes the unit in detail and explains how it can be applied as a sensitive limit switch in weighing, positioning, counting and other devices. Applications, operating principles, flexibility and design data are described. *Minneapolis-Honeywell Regulator Co.*

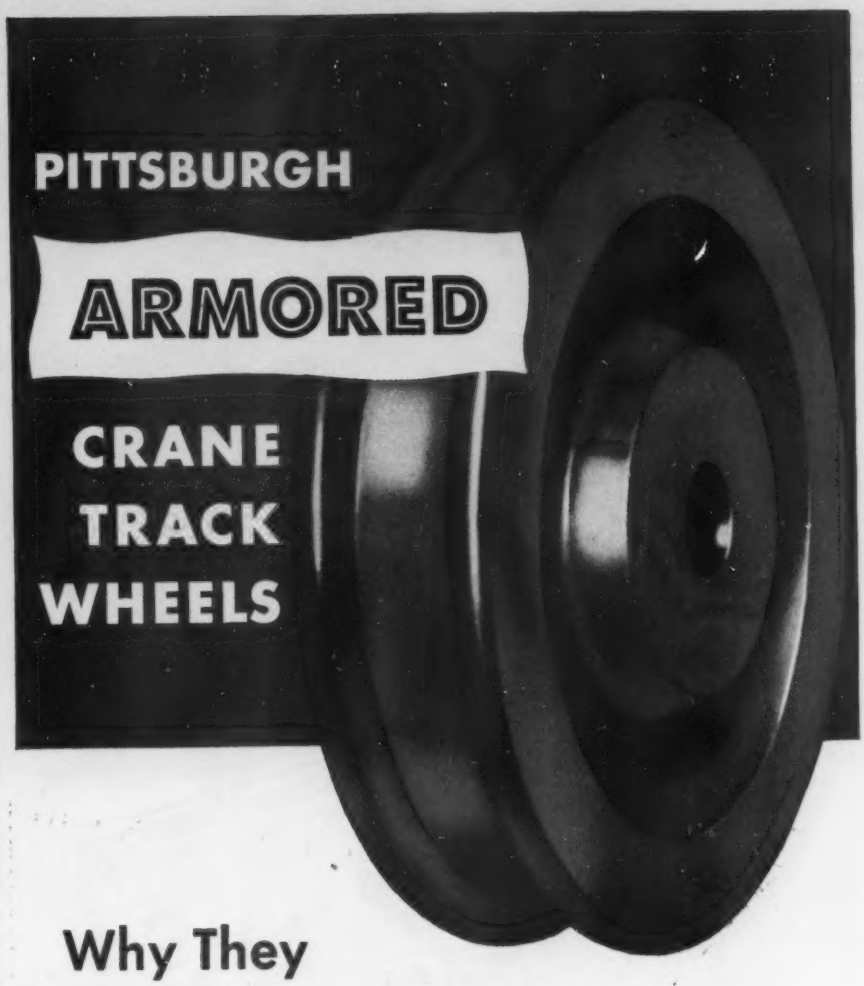
For free copy circle No. 10 on postcard, p. 132A

Products

The Ohio Knife Co. complete line of products for five major industries is covered in this catalog. Industries covered are machinery, metalworking, iron and steel, pulp and paper, and woodworking. The products are shown and technical information is given. The manufacturing operations are described. Specifications are given. *The Ohio Knife Co.*

For free copy circle No. 11 on postcard, p. 132A

Turn Page



Why They Give Exceptional Service...

• The secret of the long life of PITTSBURGH **Armored** Crane Wheels lies in something you can't see. It's part of the process perfected by PITTSBURGH which puts the right hardness in the right places. The treads and flanges are armored to the extra hardness of 601-712 B.H.N. 81-95 SC. But the cores? They are left tough and highly resistant to shock.

• This combination of hard treads and tough cores gives average service life up to five times that of untreated gears. It is your assurance of lower crane wheel costs. And PITTSBURGH gives you a written guarantee that you'll get this exceptional service.

• Available in sizes from 10" to 30" diameter. Treads: flat, tapered, radius, or "Pittsburgh Gear Company Standard." Bores and hubs may be finished by you or by us to your specifications.

Do This Today: Send us specifications of the wheels you use and we'll quote on PITTSBURGH Armored Crane Track Wheels ...guaranteed to give longer service.

PITTSBURGH GEAR COMPANY

Neville Island
Pittsburgh 25, Pa.
Phone: SPaulding 1-4600

subsidiary of BRAD FOOTE GEAR WORKS, INC. • CICERO 50, ILLINOIS

Perkins ...

"Custom tailors" to cost-conscious Design Engineers

WHETHER that cost is "first" or "operating" it will pay dividends to investigate the saving possibilities of having the gears in your products custom-made by PERKINS — one of New England's oldest and ablest gear-engineering organizations.

PERKINS MAKES:

to customers' specifications, in all materials, metallic and non-metallic: bevel gears, ratchets, sprockets, ground thread worms, spiral gears, helical gears, spur gears with shaved or ground teeth.

NOTE: The PERKINS PRECISION SPRING COILER is the latest development in the spring coiler field and eliminates entirely the use of arbors and long set-up time. It is a complete self-sufficient machine and enables you to make the spring you want when you want it — in seconds. The coiler produces any type of spring, in any diameter and any pitch with this range: Wire sizes .005 to .125. Diameter, from 3/32" to 12" and larger. Size of the compact coiler is only 7 1/2x16". A POWER MODEL is available. Information on request.

Perkins Machine & Gear Company

101 Circuit Avenue

WEST SPRINGFIELD, MASS.

FREE TECHNICAL LITERATURE

Cabinets

Three types of Trop-Arctic temperature cabinets for cold and heat requirements are covered in this new brochure. These cabinets have temperature ranges from −200°F to +300°F, according to the booklet. Among advantages listed are simplified controls, dependability of performance, and economy. The efficient design of the cabinets is emphasized. Specifications are given. *Trop-Arctic Temperature Products.*

For free copy circle No. 12 on postcard, p. 132A

Screw machine

"New Angle on Greater Profits," is the title of this brochure that has an actual aluminum part attached citing the advantages of the lightweight metal for screwmachine stock. The attached part was ordered specially to document a test conversion from brass to aluminum to produce the part. A cost savings of 33.7 pct favoring aluminum compared to brass on the basis of 10,000-piece lots is reported. *Kaiser Aluminum & Chemical Sales, Inc.*

For free copy circle No. 13 on postcard, p. 132A

Hydraulic cylinders

The new "Compact" hydraulic cylinders for general industrial application are described in this new catalog. Design features are stressed. Installation drawings for each of five cylinder mounting styles are shown. The styles available are foot, head end flange, rod end flange, extended tie rod and clevis. Dimensions for heavy-duty rod ends and piston knuckles are given. *Vickers Inc.*

For free copy circle No. 14 on postcard, p. 132A

Steel castings

Carbon and alloy steel castings are covered in this new folder. The range of castings is given. Quality, service and economy are given as advantages of these electric furnace castings. The castings are shown and their features are pointed out. A complete pictorial review of available literature describing all Farrell-Cheek products is also contained. *Farrell-Cheek Steel Co.*

For free copy circle No. 15 on postcard, p. 132A

Turn Page

brightening the future of a roll...*quickly*

The machine is a Farrel heavy-duty roll grinder. It will take heavy cuts for rough grinding or grind a roll to the highest mirror finish. On either type of work there's no faster way to grind a roll.

Rolls ground on this machine have longer life. The exceptional smoothness and absence of vibration in roll, wheel and traverse drives means less metal has to come off to clean up a roll in roughing and finishing operations.

This grinding accuracy is a vital factor in reducing the frequency of roll replacement, and consequently the cost of new rolls. Furthermore, faster grinding means increased productive capacity of the machine, and adds up to savings in labor cost.

If you would like to cut down on grinding time and cost, and refinish your rolls more accurately, look into Farrel grinders. They are available in two types—type HD shown here, and type TT with traveling work table. Bulletins giving complete specifications of either type are yours for the asking.

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.

Sales Offices: Ansonia, Buffalo, New York, Akron, Chicago, Los Angeles, Houston FB-961

Farrel-Birmingham®

NEW

Allenpoint

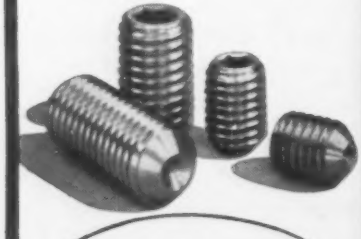
Set Screws

WITH
SCIENTIFICALLY-DESIGNED
SMALLER CUP POINTS

Smooth, deep point penetration for greater holding power and resistance to vibration; precision formed threads and accurate thread lead for maximum locking action. Comparative tests by leading laboratory prove Allen Set Screws unmatched in performance. Write to Advertising Department for Bulletin C-33A.

•

When ordering through your local industrial distributor, specify Genuine Allenpoint Set Screws.



ALLEN

MANUFACTURING COMPANY
Hartford 2, Connecticut, U.S.A.

DIECASTINGS: Beauty In Finish

Finer surface finishes and an improved method of treating aluminum diecastings have brought new beauty to diecast parts . . . See new markets in automotive, appliance, builders' hardware.

Aluminum parts can now be diecast with a surface comparable to zinc diecastings without further processing. This improvement is made possible by techniques developed by research engineers at Aluminum Company of America, Pittsburgh.

Achievement of a hardware class finish on diecast aluminum parts without additional processing, is expected to open new markets. Aluminum diecastings will now be more attractive to designers of automotive, appliance and builders hardware.

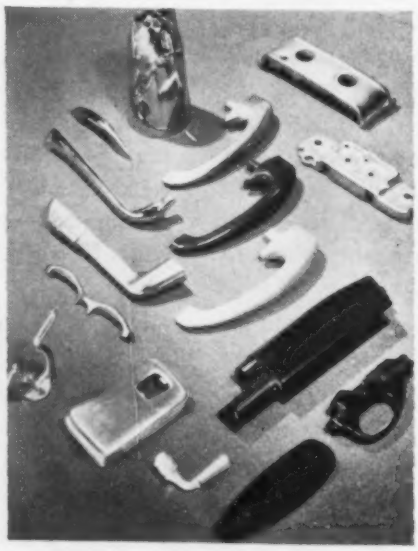
More Easily Plated

The improved surface available resulted from production and process advances by the company. These advances now have erased the principal obstruction to the wider use of chromium-plated aluminum diecastings. At the same time, other mechanical and chemical finishings will be improved.

In the past, aluminum diecastings had to be subjected to expensive finishing operations before chrome plating. With the improved finish they can be plated with very little more effort than zinc. This development will allow the designer to make use of the light weight and dimensional stability of aluminum diecastings where a chrome-plated part is required.

With the improved as-cast finishes, plated aluminum diecastings are entirely satisfactory from the standpoint of service, weathering and corrosion.

The improved diecast finishes also will make possible better Alumilite finishes in the many colors available.



Aluminum diecastings . . .

WANT MORE DATA?

You may secure additional information on any item briefed in this section by using the reply card on page 132A. Just indicate the page on which it appears. Be sure to note exactly the information wanted.

Clad Metals:

Behavior of clad steels at high temperatures studied.

Fundamental data on behavior of clad steels at high temperatures will be sought in an extensive research program sponsored by Lukens Steel Co., Coatesville, Pa.

Initially, the program will be concentrated on determining the physical properties of stainless-clad steel (18-8 type) at temperatures up to 1000° F.

This particular clad steel was selected because of the big difference in physical properties of the components: stainless and carbon steel. Particular recognition is given to the differences in thermal expansion and yield strength

and their possible effect on fatigue life under service conditions.

Will Aid Designers

Clad steels—layers of corrosion-resistant alloys or metals such as stainless, nickel, Monel, Inconel, or copper, permanently bonded to less expensive carbon or alloy steel backing plates under heat and pressure—are important construction materials, particularly in the chemical, petroleum and process industries. The study will provide data on the behavior of clad steels under long, high-temperature use.

Containers:

Fiber boxes promote safe handling, shipping.

Fiber boxes are being used in increasing quantities for shipping and storage of such iron and steel products as nuts, bolts, screws and nails.

Reasons for the trend to wider use of fiber boxes for nails are primarily economic. The unit cost is lower, and the lower weight reduces shipping costs. Moreover, fiber boxes arrive at the plant flat, saving storage space, and can be assembled quickly and by relatively unskilled employees.

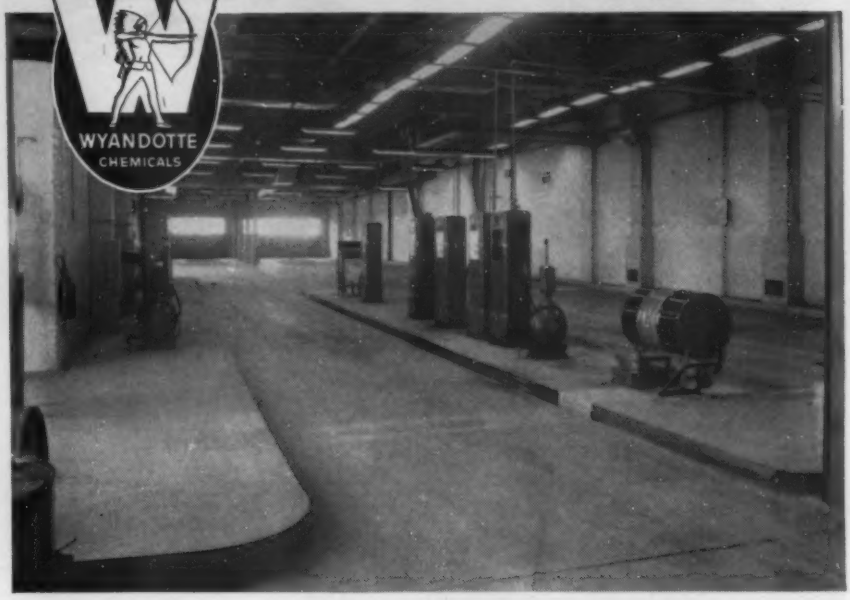
Another benefit is greater safety to the men in the shipping departments and to dealers. No nails are used to assemble the container.

Boxes Stack Easily

The fiberboard containers are smooth and have no sharp points to cause injuries of any kind. Also, these containers can be stacked almost ceiling high without toppling. When kegs were used they had to be braced when stacked, since their shapes made toppling

Cartons for nails . . .

Specialists in Industrial Cleaning Products



New York City Transit Authority bus garages use ZORBALL *to keep floors safe, dry and slip-proof.*

ZORBALL keeps N.Y.C.T.A. garage floors clean and safe!

The New York City Transit Authority, world's largest transit system, serves millions of people a day. The bus division alone operates 2,000 buses and 14 garage depots. To keep garage floors clean and safe, the New York City Transit Authority relies on ZORBALL—the all-purpose floor absorbent.

There are good reasons why users prefer ZORBALL over all other absorbents. The N.Y.C.-T.A. is sold on its resistance to breakdown, and its safety for employees and equipment. ZORBALL, in the presence of water, is non-slippery. Almost everyone agrees that ZORBALL is the safest, lowest use-cost floor absorbent available!

Safest—ZORBALL will not mud, cake or dust—remains granular, even under heavy traffic or extremely wet conditions. *Lowest use cost*—ZORBALL takes hard use longer, is easily removed, can be re-used.

Your Wyandotte representative or jobber will show how *you* can save by using economical ZORBALL. Call him today for a sample and demonstration! *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Also Los Nietos, California.*

Wyandotte CHEMICALS

Helpful service representatives in 138 cities in the United States and Canada

Largest manufacturers of specialized cleaning products for business and industry

need a finish
that blocks corrosion by itself—or under paint? specify IRIDITE

You can solve any problem of non-ferrous finishing . . . maximum corrosion protection . . . sparkling clear or colored decorative finishes, firm and lasting base for paint . . . with these two words—"specify Iridite". For example—

- **ON ZINC AND CADMIUM** you can get highly corrosion resistant finishes to meet any military or civilian specifications and ranging in appearance from olive drab through sparkling bright and dyed colors.
- **ON COPPER . . .** Iridite brightens copper, keeps it tarnish-free; also lets you drastically cut the cost of copper-chrome plating by reducing the need for buffing.
- **ON ALUMINUM** Iridite gives you a choice of natural aluminum, a golden yellow or dye colored finishes. No special racks. No high temperatures. No long immersion. Process in bulk.
- **ON MAGNESIUM** Iridite provides a highly protective film in deepening shades of brown. No boiling, elaborate cleaning or long immersions.

AND IRIDITE IS EASY TO APPLY. Goes on at room temperature by dip, brush or spray. No electrolysis. No special equipment. No exhausts. No specially trained operators. Single dip for basic coatings. Double dip for dye colors. The protective Iridite coating is not a superimposed film, cannot flake, chip or peel.

WANT TO KNOW MORE? We'll gladly treat samples or send you complete data. Write direct or call in your Iridite Field Engineer. He's listed under "Plating Supplies" in your classified telephone book.

ALLIED RESEARCH PRODUCTS
INCORPORATED
4004-06 E. MONUMENT STREET • BALTIMORE 5, MD

a problem where they were stored.

American Steel and Wire Div. of U. S. Steel and other large volume producers of nails and bolts are using fiber boxes constructed to provide three protective thicknesses of board on all surfaces. The telescoping cover has die-cut handholes for easy opening.

Designed for Automatic Filling

Another popular fiber box for nails is designed for fully automatic filling and sealing. It is manufactured with water-proof adhesives, and is constructed so it can be easily opened.

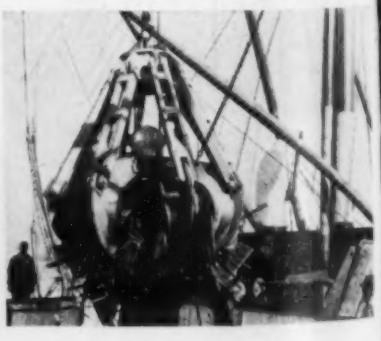
Many other high density products are now being shipped in fiber boxes. Among these are die sets, electric motors, welding electrodes, power tools, switch-boxes, appliances, chain and similar products.

Handling:

New grapple speeds scrap metals handling.

A new grapple developed for handling metal scrap is cutting loading time considerably for scrap metal dealers.

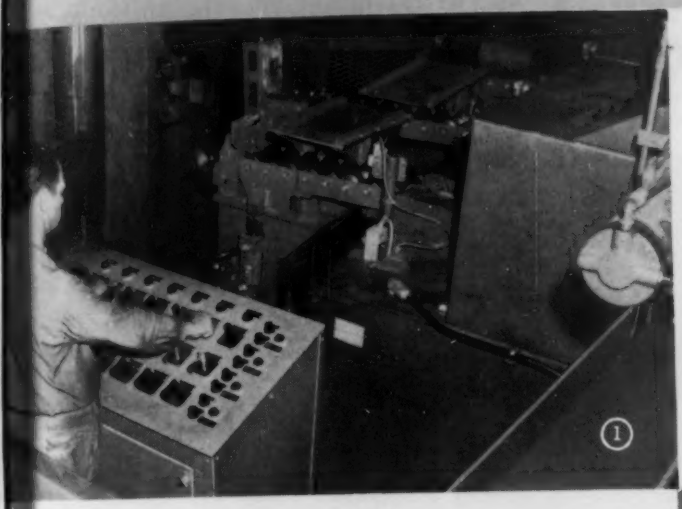
A new principle of operation is introduced in the grapple which is being introduced by the H. C. Penn Machinery Co., Inc., of New York, distributors for Ruhr Industries. Tines of the unusual grapple have a floating action with both horizontal and vertical movements permitting any two of the six or eight tines to secure a powerful grip on any object regardless of its shape. The action is similar to that of the fingers of a hand when grasping an object.



Speeds scrap handling . . .

SPEED OF HEATING (2-3 minutes per billet)

Attracts More and More Copper and Brass People to Low-Frequency Induction Heating



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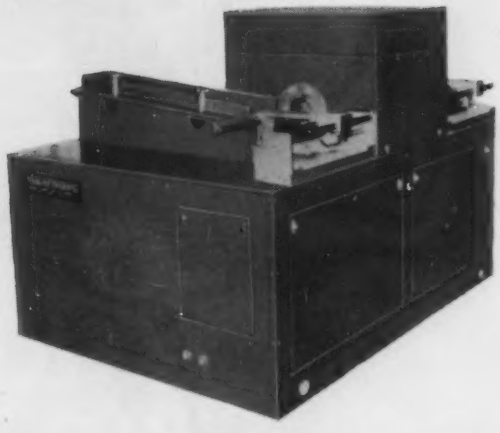

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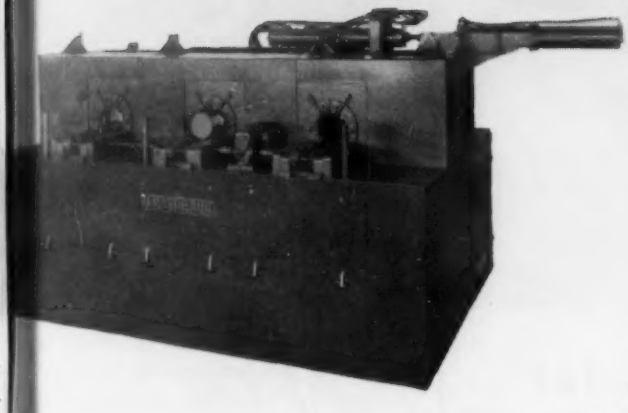

③

④

trol Stand for brass heater. n pulpit, operator can handle functions step by step, or he switch to "Automatic Control" ix buttons on press column.

small production, a single coil KW, 2300 volts, 3-phase, 60 les. Heats 60—5" billets per r.

ts 72—7" dia. billets per hour. ee-coil, 2300 volts.

billets 7" dia. and 24" long—coil brass heater rated 700 —pre-heats 7,500 lbs. per hour.

Copper or brass billets are heated in two or three minutes with a Magnethermic . . . as compared with hours by other methods. Speed is not the only advantage of induction heating. You eliminate need for scheduling billets ahead of time since a Magnethermic does not require warm-up time. Press the button and a hot billet will be ready in minutes. Maintenance is limited to coil repair (changed in 10 minutes or relined in less than two hours) as compared to furnace relinings requiring days.

Heaters operate efficiently on extrusion billets, wire bars and other conventional shapes. The low first cost of 60-cycle heating, plus the advantages of speed, space, rapid start, accurate temperature control, has caused more and more copper and brass people to seriously consider this method, pioneered by Magnethermic. Some recent installations are shown here.

Your inquiry . . .

If you want information on a Magnethermic Heater for your plant, let us know what size billet you intend to heat; for what use; and desired production rate. Your inquiry will receive prompt attention.

60-CYCLE

MAGNE ERMIC

corp ation

3990 SIMON R YOUNGSTOWN 7, OHIO

INDUCTION HEATING

FORT PITT BRIDGE

Engineers • Fabricators Erectors

STEEL MILL BUILDINGS for the leaders in the Steel Industry

It has been our pleasure to work with many of the steel producing companies by furnishing the structural steel for their new and expanded mill buildings.

On your next structural steel project, why not utilize the experience and facilities of Fort Pitt —structural steel specialists for over 57 years.

Steel Permits Streamlining Construction with Safety, Endurance and Economy

AISC — American Institute of Steel Construction, Inc. — Founded 1921

Fort Pitt BRIDGE WORKS

Member American Institute of Steel Construction

General Offices, PITTSBURGH, PA. • *Plant at* CANONSBURG, PA.

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When two of the tines contact an object, the others form around the load. A six-part line inside the grapple gives a holding power of 6 times the weight of the grapple itself. Thus, a 1 cu yd grapple, weighing 5170 lbs would have a closing pressure of 31,020 lb.

Grinding:

Microsizer adjusts grinding wheels hydraulically.

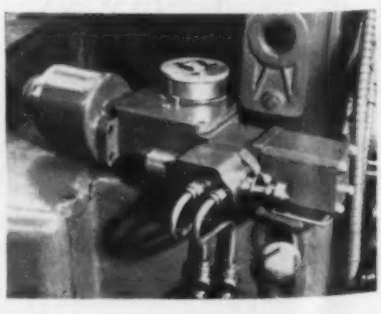
A recently developed hydraulically operated mechanism for adjusting and correcting for size in centerless grinding makes possible high precision work by unskilled hands.

Previously the adjustment of grinding wheels usually required certain visual and manual aptitudes for correctly setting the vernier dials. Now all that is necessary is to touch a push-button and the preset hydraulic pressure makes the proper setting.

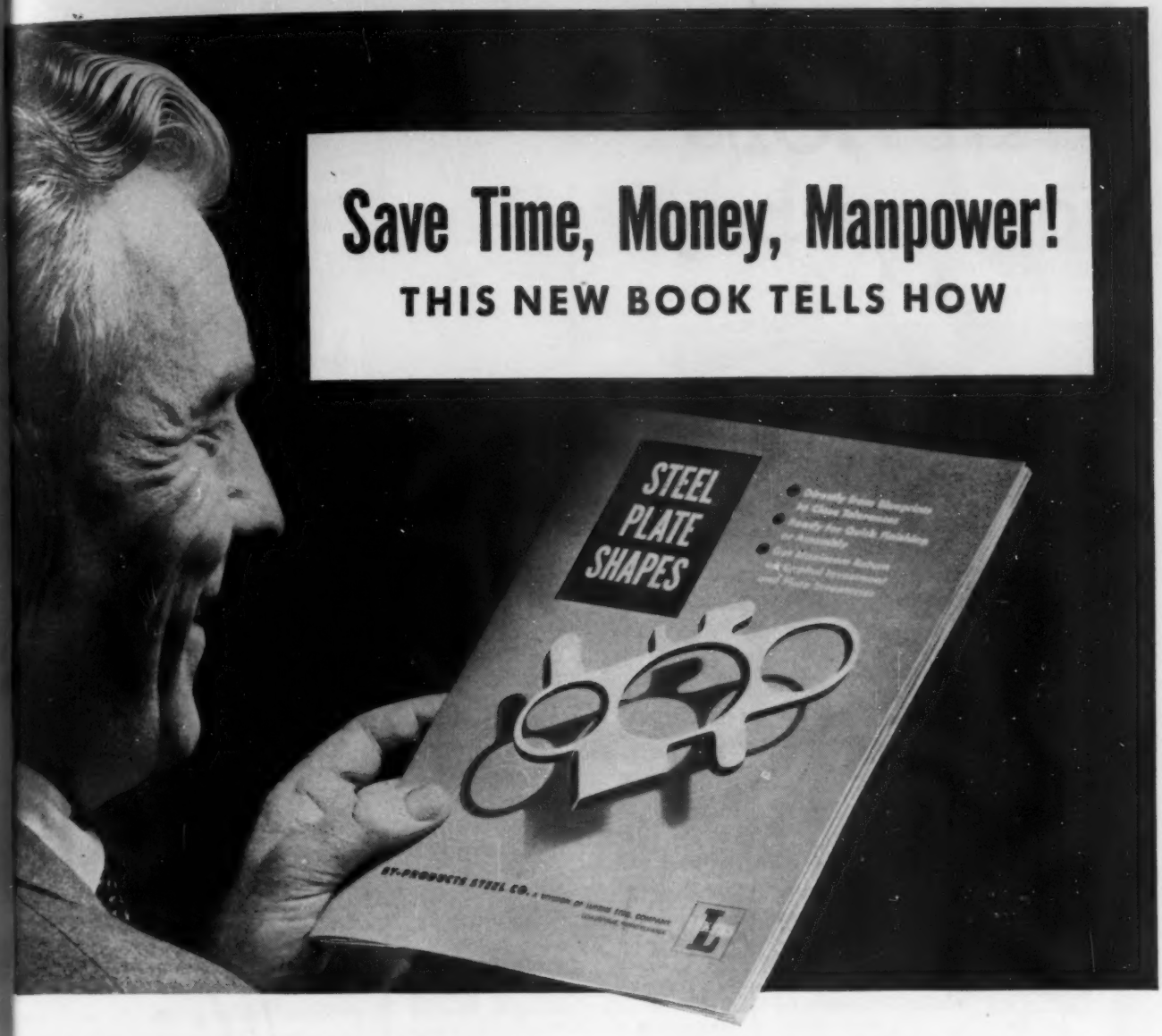
Press A Button

The pushbutton microsizer recently developed by Arthur Scrivener Ltd., Birmingham, England, is so arranged that on the pressure of an operating button the fine feed shaft of the machine is rotated a predetermined amount. The amount that the wheelhead is fed forward by each pressure of the push-button can be selected by the rotation of a selector knob.

This knob gives a range of five increments varying from 0.0001 to 0.0005 in, the exact amount being indicated by numbers on the knob. The device is useful in shops on long runs of work to close limits where unskilled labor operates the centerless grinders.



Hydraulic setter . . .



Here's a new book that will show you how Steel Plate Shapes Service can cut production costs. Pre-formed component parts help you save time, money and manpower in production.

You eliminate one or more production steps with steel plate shapes. They can be formed to such close tolerances that machining is often unnecessary before assembly. You can free your equipment . . . do more jobs . . . get greater output, all without increasing your investment. And you save freight costs on the parts you buy, eliminate steel plate inventories and the expense of scrap handling or scrap losses.

Steel Plate Shapes Service offers you over 150 major machines to flame-cut, shear, blank, press, bend or otherwise form rolled steel plate to meet your specifications. Parts can be furnished as formed, or rough- or finish-machined. A large stock of standard dies of all types is maintained. No patterns are needed—work can be directly from blue-prints.

FIND OUT MORE about how Steel Plate Shapes Service can help you find new production savings. Use this coupon or write for a free copy of Bulletin 712 on your company letterhead. Address By-Products Steel Co., 672 Strode Avenue, Coatesville, Pa.

LUKENS

BY-PRODUCTS STEEL CO.

A Division of Lukens Steel Company

BY-PRODUCTS STEEL CO.
741 Strode Avenue
Coatesville, Pa.

Please send me a free copy of Bulletin 712.

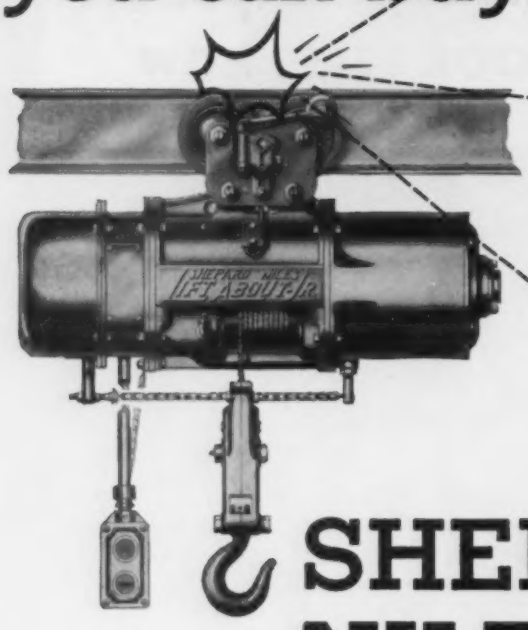
NAME.....

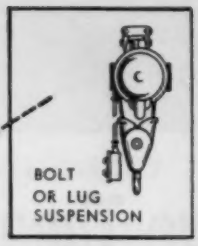
TITLE.....

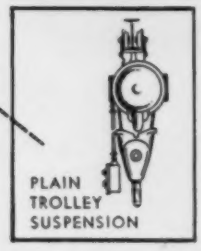
COMPANY.....

CITY.....ZONE.....STATE.....

TOUGHEST *Light-Service* HOIST you can buy!

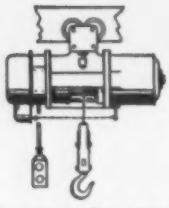




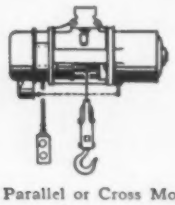


SHEPARD NILES

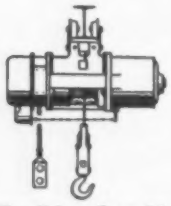
LIFT ABOUT-JR.



500 T Parallel or Cross Mounted.



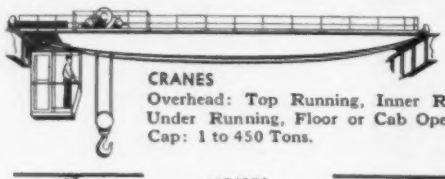
1000 J Parallel or Cross Mounted.



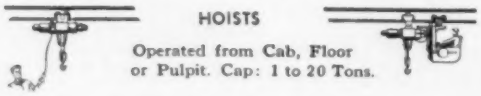
2000 M Parallel or Cross Mounted.

Hook your load to a Lift About-Jr.—it's the toughest light-service hoist you can buy. This rugged Shepard Niles Hoist is ideal for a hundred-and-one lifting jobs, guarantees you years of dependable service. It offers trouble-free wire rope hoisting, either rope or push-button operation.

Let a Shepard Niles representative tell you about the complete Lift About-Jr. line. He'll help you select the hoist with the right capacity and controls for your job.



CRANES
Overhead: Top Running, Inner Running, Under Running, Floor or Cab Operated. Cap: 1 to 450 Tons.



HOISTS
Operated from Cab, Floor or Pulpit. Cap: 1 to 20 Tons.

MAIL COUPON!

SHEPARD NILES Crane and Hoist Corporation
1446 Schuyler Ave., Montour Falls, N.Y.

( ) *Please send me your new Lift About-Jr. Bulletin.*
( ) *Please have a representative call.*

NAME _____ TITLE _____

COMPANY _____

STREET _____

CITY _____ STATE _____

A second type extends the principle to electrical operation of the microsizer undercontrol of accurate pneumatic measuring equipment. This type is applicable for the continuous automatic control of size on throughfeed centerless work.

Work leaving the grinder passes through a special ring gage which is provided with two measuring jets and a monitoring jet. The latter ensures that measuring jets only function when work is actually in the gage.

Use With Plunge-Grinding

A third type is intended for application to plunge-grinding operations when it is not possible for the work to pass continuously through a ring gage. Similar equipment of the second type is again used, but a suitable gaging head is mounted near the operator.

As the work is ejected from the machine it is placed in this head which automatically checks the piece. If it is out of the upper tolerance limit the microsizer automatically advances the wheels the predetermined amount to compensate.

In the case of a fully-automatic machine for long run plunge-ground components, it is sometimes possible for the feeding gear to also transfer the finish-ground piece to the measuring instrument, making the operation entirely automatic.

Radiation:

Lead sandwich solves X-ray radiation problem.

Lead sandwiched between steel plates, glass that is 75 pct lead and lead bricks are being used more and more for radiation protection as larger X-ray units are built.

Recent developments in nondestructive, industrial and medical X-ray applications indicate the increasing use of units in the 2-million volt range. This brings with it the necessity of developing better protection for personnel, particularly from stray radiation.

Both concrete and lead have been used as protective barriers. The

Republic Aviation operates P&H high-frequency welders as standard metallic arc welders, also, so that duplicate equipment does not have to be purchased.

More than doubles welding speed with P&H

30 P&H TH-200 high-frequency machines make inert gas arc welding 2½ to 3 times faster than former gas welding at Republic Aviation Corporation

No replacement maintenance in three and a half years of two-shift operation

You don't have to take our word for the outstanding performance record of P&H Welders. The following statements are actual quotes from a certified report issued by the H. P. Gould Co. of Chicago, who made an impartial study of welding operations at Republic Aviation Corporation, Farmingdale, L. I., N. Y.

"In the building of faster and better aircraft, new developments in welding have played an important part and P&H high-frequency inert gas welding has proved that it can solve the problems of welding aluminum alloys.

"Three and a half years ago, Republic Aviation tested P&H TH-200 HF Inert Gas AC Arc Welders, and evaluated them against the existing equipment in the plant, as well as against outside competition.

"P&H welders of four different types are now used in four locations in the plant, for the welding of hundreds of different parts. In general, they are welding aluminum alloys from .032" thickness up to .250", and heat-resisting alloys from .010" up to a thickness of .093". For arc-welding alloy steels (4130, 4140, 8630, 8740, etc.), experience has proved P&H electrode AW-4 most satisfactory, and it is used exclusively.

"Republic Aviation welding engineers back up the claim of the makers that P&H welders require very little maintenance. The 30 high-frequency arc welders have had no replacement maintenance whatever in three and a half years of two-shift operation — and the operating cost of each P&H TH-200 HF Welder is only 40¢ per day."

Like Republic Aviation, whose studies show P&H inert gas arc welding to be 2½ to 3 times as fast as former gas welding you, too, can enjoy the money-saving advantages of P&H Arc Welders with Dialectric Control. You, too, can get faster, better welds at lower cost.

We've given you the Republic Aviation story in a nutshell! You can get all the detailed facts and figures by reading Gould Report No. 5311. Write for your copy today.

P&H WELDING DIVISION

HARNISCHFEGER CORPORATION

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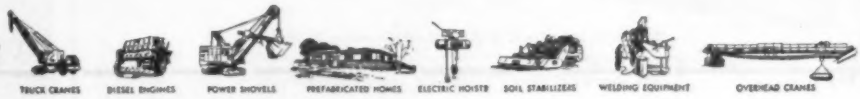
the P&H Line



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"We've standardized on Janitrol . . .

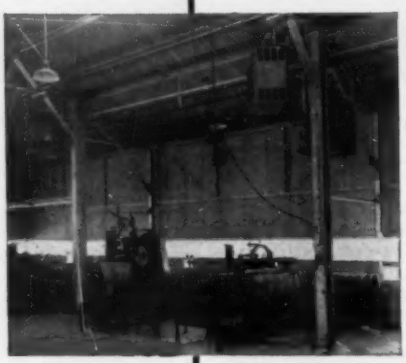
400 units proved in long service"

AT REED ROLLER BIT CO., HOUSTON

says Mr. S. P. Robertson
Chief Industrial Engineer

"Janitrol heating equipment has been in use here at Reed Roller Bit Company for many years. Its satisfactory service record having been proved, we have for obvious reasons of efficiency and economy standardized on Janitrol throughout our expanding manufacturing facilities", states Mr. Robertson.

Reed Roller Bit now has over 400 units in year 'round use for heating in winter and ventilation in summer. The durability and performance of Janitrol in this and similar installations is again evidence of *proved* value in both equipment and installation.



Janitrol Unit Heaters are suspended over production area and directed to "spot" the heat just where required.

For more information on the use of unit heaters in many types of buildings write for your copy of "Businessman's Blue Book of Better Heating".

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GAS-FIRED UNIT HEATERS

Janitrol Heating & Air Conditioning Division
Surface Combustion Corporation, Columbus 16, Ohio
In Canada: Alvar Simpson Ltd., Toronto 13

ALSO MAKERS OF *Surface* INDUSTRIAL FURNACES AND *Kathabar* HUMIDITY CONDITIONING

latter, which is the densest of common materials, has taken the form of bricks, cast slabs, or leaded glass.

Concrete to 4 Feet Thick

Typical of the structure required to house super-voltage X-ray machines is the Deep Therapy room of the Swedish Hospital's Tumor Institute in Seattle, Wash. Here, a 2-million volt Van deGraaf X-ray generator, capable of penetrating steel as thick as 12 in., was installed.

The walls and ceiling of the X-ray room located in the basement of the hospital, are of concrete up to 4 ft thick. The dimensions of the room are 17 x 22 ft.

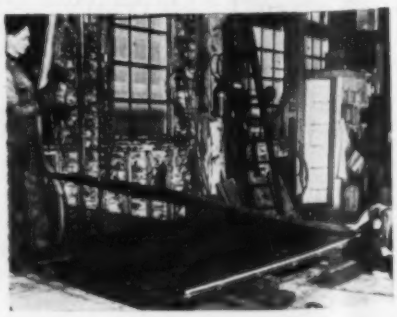
Alternate Lead, Steel Used

The entrance is a 4 x 7 ft opening in the concrete. To guard against the escape of stray radiation, a unique lead door measuring 6 x 9 ft to cover the opening is used.

The door is made up of alternate sheets of 3/16 in. steel, ¾ in. lead, 1 in. steel, ¾ in. lead and 3/16 in. steel. Total thickness of the door is 2⅞ in., and weight 9000 lb.

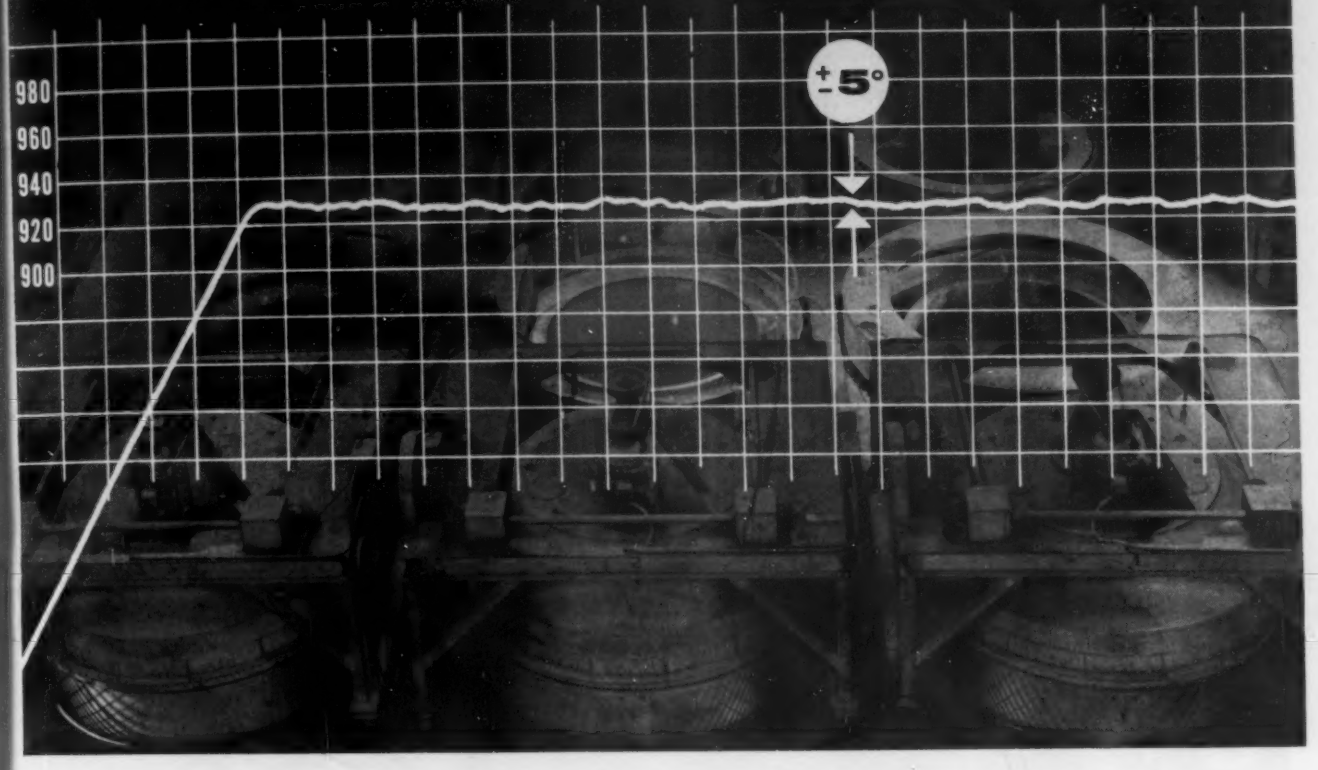
Due to the extreme weight, the door was designed to slide on railroad rail to which are attached standard ball bearing pillow blocks. A ¾ hp motor moves the 4½-ton mass, at a speed of 4 feet in 20 seconds. The door has on-off switches on both inside and outside. It also has on its leading edge a safety device which prevents anyone being caught during closing. In case of power failure, the door is hand operated.

Operation of the generator is controlled from a desk-type console in an adjoining room. The operator looks through glass that could almost be called transparent



Lead-steel sandwich . . .

closer control in 'Surface' convection furnaces



DEVELOPS MAXIMUM PHYSICALS IN LIGHT METALS

When your heat treatments of light metals require temperatures close to melting points, 'Surface' furnaces give you the "pinpoint" control you need.

Forced convection, pioneered by 'Surface,' heats pieces uniformly through thick and thin cross sections. Temperature uniformities of plus-minus 5°F throughout large, dense charges are typical. Convection heating is fast since heat transfer is not impeded by the reflective properties of light metals.

'Surface' convection furnaces have proved their advantages throughout the light metals industry. For example, one aluminum producer alone has purchased 135 large 'Surface' furnaces.

There is a size and type, batch or continuous, to meet your requirements. Find out about it from your 'Surface' representative, or write for Literature H54-5.

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lead, since it analyses 75 pct metallic lead by weight. Furnished by Penberthy Instrument Co., Seattle, Wash., this new glass, called Hi-D, has a high refractive index and amazing clarity. The former permits extremely wide angle viewing, while the latter permits photographs in the room to be taken from outside the shielded cell.

The glass is almost as heavy as steel, weighing 390 lb per cu ft, which is 2½ times as heavy as ordinary window glass. Its radiation-shielding value is ½ that of metallic lead and three times that of ordinary concrete.

The design work on the door part of the equipment was done by C. A. Pangborn, a Seattle consulting engineer. The construction of the door was done by the Pacific Steel Products Co., also in Seattle, while the lead came from Federated Metals Div., American Smelting and Refining Co.

Research:

Thermal barrier effects on aircraft discussed.

Both optimistic and pessimistic views on thermal barrier problems were expressed by engineers at the annual meeting of the American Society of Mechanical Engineers held in New York recently. It was generally agreed that research on the effect of high-speed, high-altitude flight lagged behind the design of aircraft to fly in the thermal barrier.

The thermal barrier applies to the high temperature met by aircraft beyond Mach 2 or twice the velocity of sound. Nine technical papers on thermal flight problems were delivered. Nuclear-powered aircraft, pilotless aircraft, and the effect of thermal flights on man, equipment, and aircraft structure were subjects covered.

Steel, Aluminum Melt

Startling problems are presented by supersonic heating, engineers pointed out. For example, at Mach 5 aluminum melts, and at Mach 6 steel melts.

Optimists believe aircraft without radical design changes, following carefully prescribed flight paths, can weather thermal flight conditions. A suitably designed plane or missile, might fly very fast at extreme altitude where the density of air is practicaly zero and then proceed at reduced speed while passing through lower altitudes.

The "Pessimistic" View

The more pessimistic contend that the damaging effect of heating during thermal flight can be prevented for only short periods. They pointed out that aircraft engineers will have to design aircraft to carry loads at temperatures of anywhere from 200° to 1600°F or more.

In pilotless aircraft such as missiles and rockets, heat effects might be alleviated by allowing certain parts of the missile to melt. The melting process would be similar to that of meteorites that fall to earth. In meteorites melting oc-

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Materials designed to withstand high temperatures, new plane cooling systems are needed . . .

curs at the surface while the interior remains relatively cool.

What Are Limits?

Results of one research project on structural aspects of thermal flight has pointed to a possible upper limit with present engineering materials of about Mach 3.5 speed for any sustained period of time.

At this speed, the weight necessary to make the plane structurally sound at 800°F would render the aircraft impractical. A Mach 3.5 fighter might weigh as much as current heavy bombers.

Two approaches to design of high-speed piloted aircraft seem indicated. One is to design the aircraft to endure the high temperatures, the other is to keep the airplane cool so that conventional designs may be used.

Cooling Systems Needed

The first course presents almost insurmountable problems even at moderately high Mach numbers. Possibilities for the second course included cooling by air-cycle systems, water-evaporation systems, and fuel cooling in chemically fueled aircraft.

The need for closer cooperation between engineering and the biological sciences was emphasized. Despite effectiveness of cabin-pressurization and pressure-breathing equipment, such factors as sudden loss of pressure and acceleration during combat maneuvers may result in loss of pilot consciousness, or in death.

What Are Pilot's Limits?

Air crews should be indoctrinated to understand their own physical limitations while in flight. It was pointed out that a supersonic aircraft may cover a mile or more between the time the pilot sees a situation and the time he moves his muscles to respond to it.

Among other points raised in the thermal barrier symposium were:

1—The heat problem in turbojets is further complicated by blade-flutter. If vibration or heat damages even one of the 1000 blades of a turbo-jet's compressor, the engine may be wrecked completely.

Artificial Heat Sinks

2—Engineers would like to use the large fuel supplies carried by supersonic aircraft as a sink to draw up the excess heat. However, the fuel system designer also might have to use artificial heat sinks. It was agreed that at present water still seems to be the most efficient cooling agent.

3—Time is an essential factor in determining stresses in supersonic aircraft parts. There is a possibility that the designer will have

FOR A TROUBLE-PROOF FINISH--- START AT THE BOTTOM!

No buffing compound remains after this aluminum casting has been precleaned with a Magnus Emulsion Cleaner.

Removing buffing compounds or oily dirt films from metal surfaces is easily accomplished by precleaning with a Magnus Emulsion Cleaner. A simple dip or spray penetrates the grime, loosening it for easy removal with a water rinse.

Magnus Emulsion Cleaners are non-toxic, non-corrosive and have no unpleasant fumes. Cleaning is safe, dependable and economical.

A demonstration will open your eyes to the improvements in quality and the reduction in cleaning costs offered by Magnus Emulsion Cleaners. Write for information—no obligation, of course.

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Wherever sheet metal scrap accumulates in volume, it presents two problems: *First* — neat, orderly disposal with minimum disturbance to plant operation. *Second* — profitable salvaging.

A well integrated scrap salvaging operation, built around the right size and type of baling equipment, can solve *both problems* for you just as it has for many others.

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If you need help in planning Profitable Salvaging of your sheet metal scrap, you can rely on Galland-Henning for competent counsel based on years of successful experience in the design, construction and installation of scrap metal balers.

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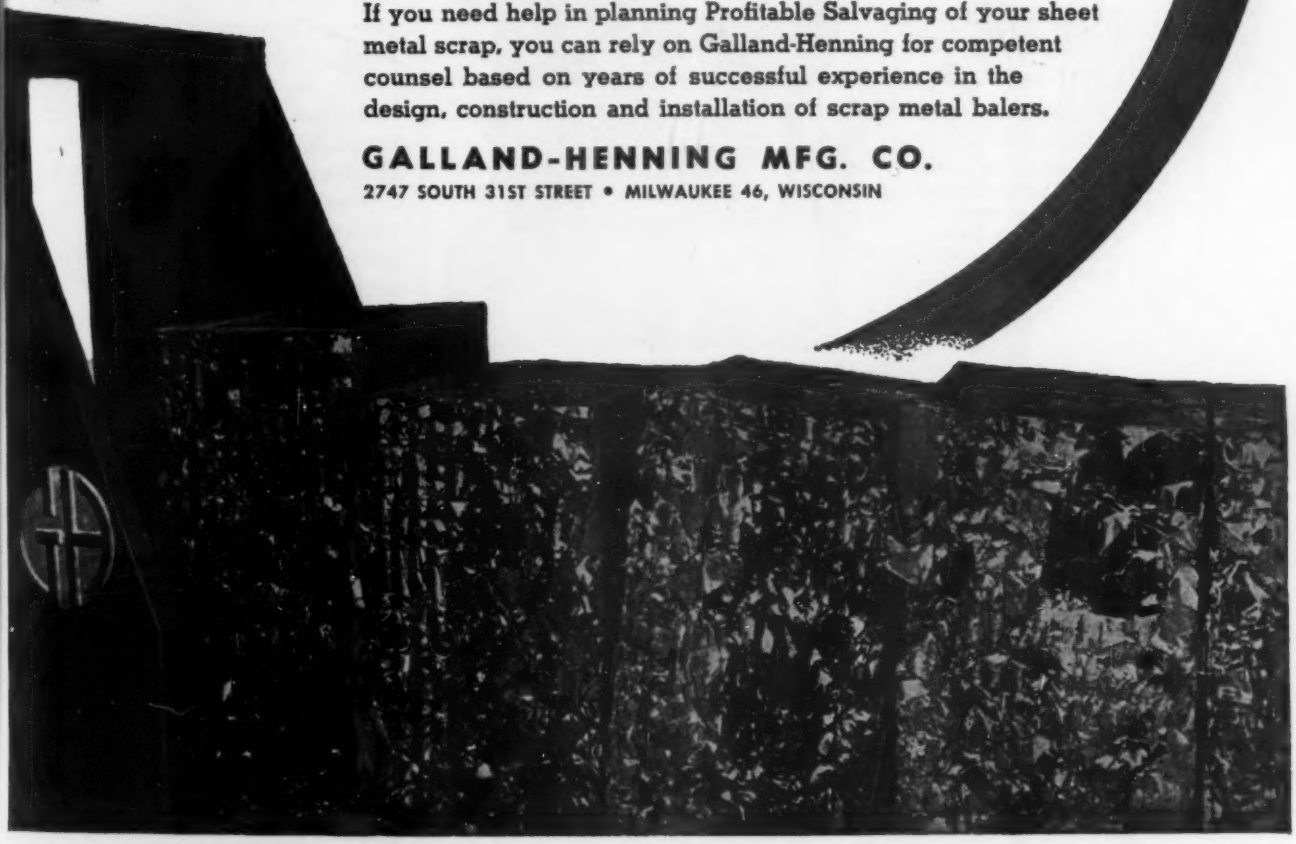

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SCRAP METAL BALING PRESSES

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to design each structural element for a definite lifetime where parts or whole planes will be replaced rapidly, perhaps as often as after each flight or longer than a few minutes.

May Use More Castings

4—There may be more castings in future aircraft manufacture, since data shows some cast materials to have higher allowable creep strength than wrough plates.

The thermal problem is such that over-all research, unless accelerated, will soon find itself 5 to 10 years behind aerodynamics and propulsion.

Working on the fringe problems associated with 300° F temperatures is entirely inadequate. Investigation of the problems peculiar to each temperature range up to 1000° F and beyond is required.

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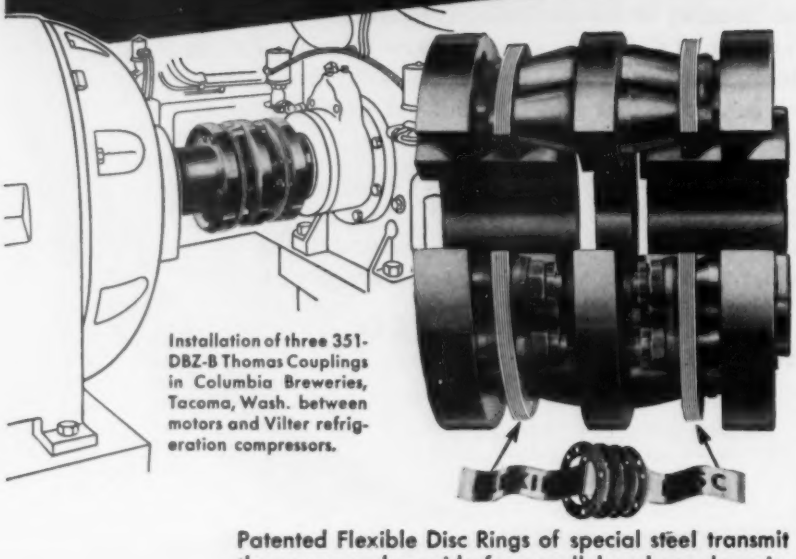
for more years of better service!

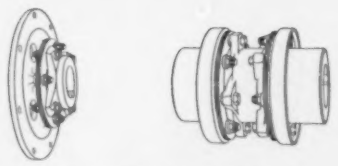


Installation of three 351-DBZ-B Thomas Couplings in Columbia Breweries, Tacoma, Wash. between motors and Vilter refrigeration compressors.

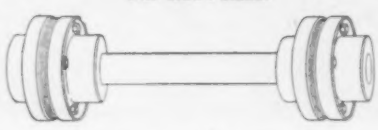
Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.

DISTINCTIVE ADVANTAGES

FACTS	EXPLANATION
NO MAINTENANCE	Requires No Attention. Visual Inspection While Operating.
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.



THOMAS COUPLINGS ARE MADE FOR A WIDE RANGE OF SPEEDS, HORSEPOWER AND SHAFT SIZES.



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THOMAS

THOMAS FLEXIBLE COUPLING COMPANY
Largest Exclusive Coupling Manufacturer in the World
WARREN, PENNSYLVANIA, U.S.A.

Shearing:

Big shear cuts through hot 7 x 42 in. steel slabs.

A new mechanical motor driven shear, latest addition to the 40 in. blooming mill facilities at the Clairton Works, U. S. Steel Corp., is designed to cut hot steel slabs up to 7 in. thick and 42 in. wide. It was recently installed to replace a smaller unit.

Designed by Lewis Machinery Div., Blaw-Knox Company, Pittsburgh, the shear weighs 400,000 lb, has a maximum knife pressure of 2,200,000 lb, and a 13-in. combined up-and-down stroke. It will make up to 12 cuts per minute and is powered by a 250 hp motor.

Unique In Design

On the entry side, the shear is fitted with a hydraulic hold-down or gag to prevent the ends of the sheared material from raising off the cutting table during shearing, thus reducing damage to the table, or distortion of the bar.

The gag, unique in design, is equipped with a stabilizer which keeps it in a vertical position to the material to be sheared in such a way that blooms or slabs are always cut at 90° angles. The shear is also equipped with a hydraulically operated crop pusher.

On the delivery side a pullaway table permits crops to fall down a chute to a chain-bar conveyor, which transports them from the

Shears steel slabs . . .

Turn to p. 153

shear up an incline and drops them into charging boxes, to be returned to the openhearths. A solid retractable forged steel gauge head, which can be adjusted to varying lengths, stops blooms or slabs coming down the shear run out table.

This gage head is raised to permit material to pass on to the cooling bed. Run out, transfer cooling tables, and other auxiliary equipment were designed and manufactured by Lewis.

Titanium:

Improved acid pickle reduces hydrogen pickup.

In processing titanium and titanium alloys three basic precautions are necessary. Heating should be carried out in an oxidizing flame when fuel fired furnaces are used; long soaks should be avoided; when pickling in hydrofluoric-nitric acid baths the nitric acid content should be held at 20 pct minimum with the hydrofluoric acid content between 1½ to 2 pct.

Use Conventional Pickle

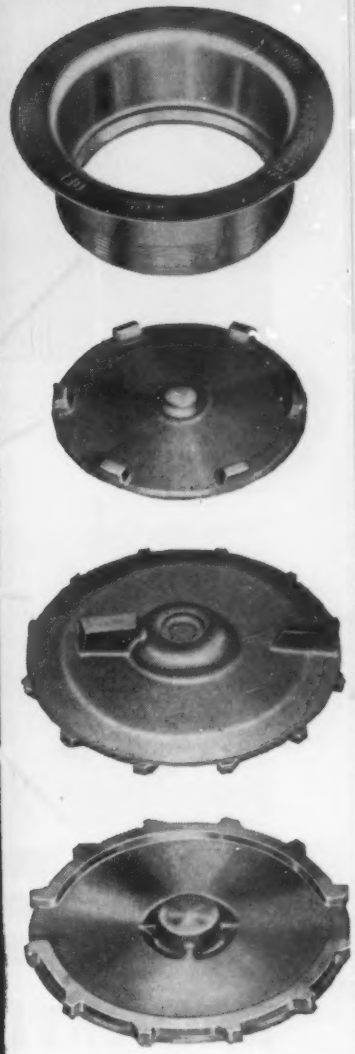
One of the chief processing improvements incorporated in the manufacture of all of its sheet products by Rem-Cru Titanium, Inc., Midland, Pa., is an improved acid pickling bath which greatly reduces hydrogen pickup.

The conventional stainless steel pickling bath contains about 10 pct nitric and 2 pct hydrofluoric acid. Since titanium sheet is usually processed on equipment also used to process stainless steel, it became a widespread standard practice to employ the nominal 10-2 bath for titanium also.

Control of such baths has not been of critical importance for stainless, and doubtless the nitric acid content often dropped below the nominal 10 pct. The effect this had on accelerating hydrogen absorption by titanium was discovered by one of the process investigations Rem-Cru made to minimize the hydrogen content of its products.

MUELLER BRASS CO. forgings* contribute to the efficiency of this modern waste disposal unit

*MUELLER BRASS CO. facilities include: designing, die-making, forging, tooling, machining, polishing, plating and assembly



Three Mueller Brass Co. forgings play an important part in the fine operating performance of this modern waste disposal unit made by the Eureka-Williams Co., Division of the Henney Motor Co., Inc. This unit does a speedy and thoroughly effective job of pulverizing garbage and has made life easier for American housewives. The impeller disposer that chops up the waste food in the disposal unit, the disposer cover and the sink mounting flange are all forged by the Mueller Brass Co. This is another outstanding instance where Mueller Brass Co. forgings have improved product performance and cut costs. High quality forgings can be produced from standard and special brass, bronze and aluminum alloys. And in addition, the Mueller Brass Co. offers complete service ranging from product design to finished part . . . Write today for complete information and new 32 page forgings handbook.

1. Sink mounting flange, forged, machined, nickel and chrome plated by Mueller Brass Co.
2. Machined and finished disposer cover forging.
3. Cutting side of impeller disposer forged from 600 series bearing bronze.
4. Reverse side of impeller disposer.

MUELLER BRASS CO.

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"It costs Less to DO IT RIGHT . . . . . than to DO IT OVER"

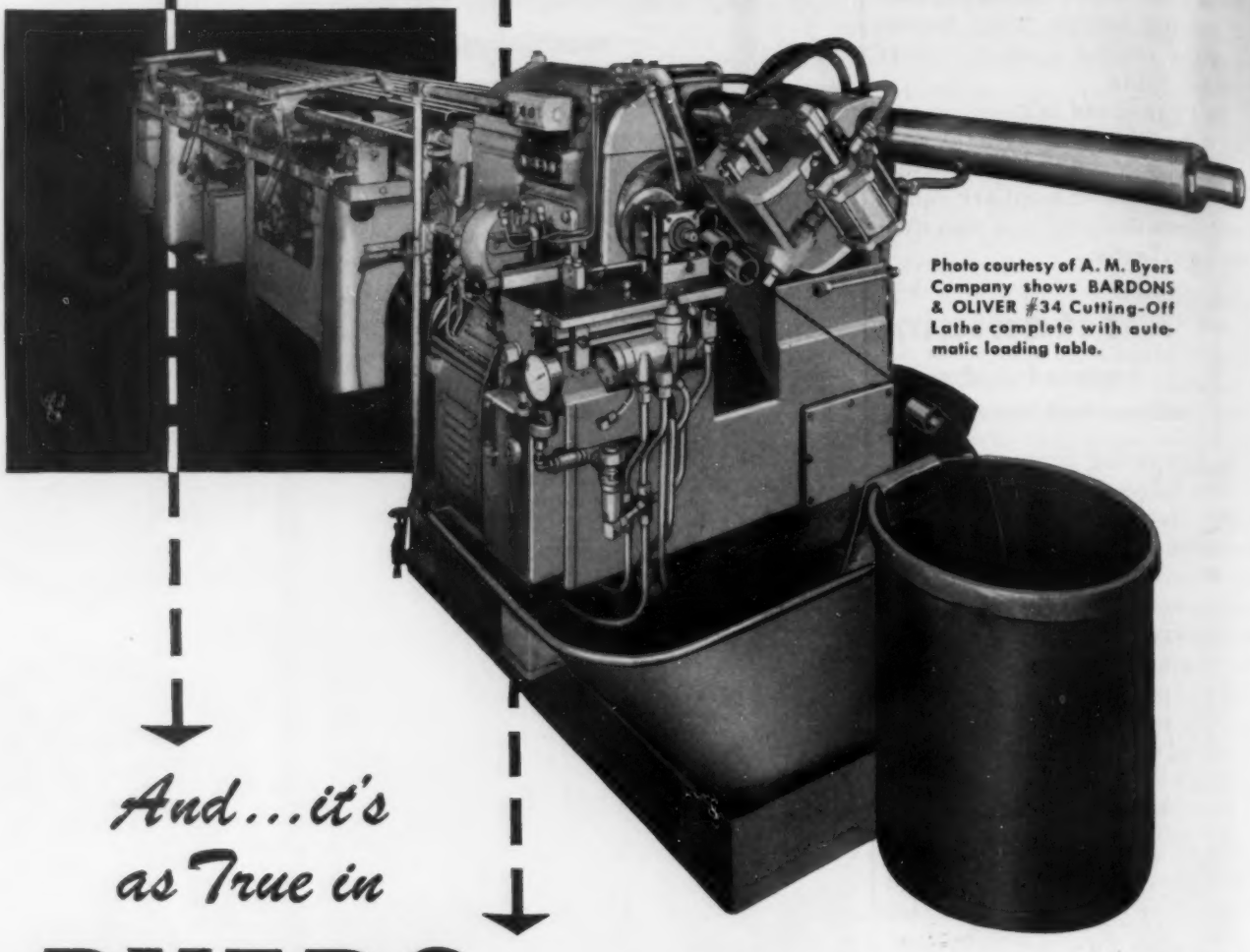

Photo courtesy of A. M. Byers Company shows BARDONS & OLIVER #34 Cutting-Off Lathe complete with automatic loading table.

And . . . it's as True in

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CUT-OFF LATHES

"It costs less to *do it right* . . . than to *do it over*" is the famous slogan of A. M. BYERS COMPANY, America's oldest and largest manufacturers of wrought iron pipe and tubular products . . . and they *practice what they preach* in the selection of BARDONS & OLIVER Cutting-Off Lathes. The folks at Byers are well aware of the advantages in buying *QUALITY* machines for lasting service. The quality built into every BARDONS & OLIVER Cutting-Off Lathe means years of accurate, dependable operation with peak production, and . . . speaking of peak production, the A. M. Byers Company is cutting-off and chamfering 1¼" Wrought Iron Pipe Coupling Blanks at the rate of 900 per hour . . . a real production bonus.

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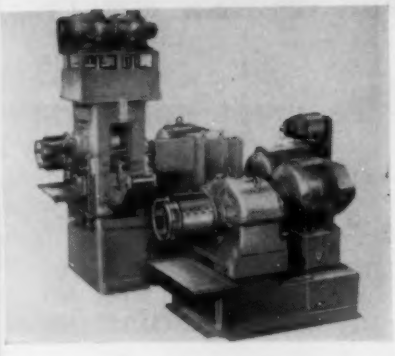
NEW EQUIPMENT

New and improved production ideas, equipment, services and methods described here offer production economies . . . for more data use the free postcard on page 132A or 132B



All-in-one rolling mill handles narrow strip

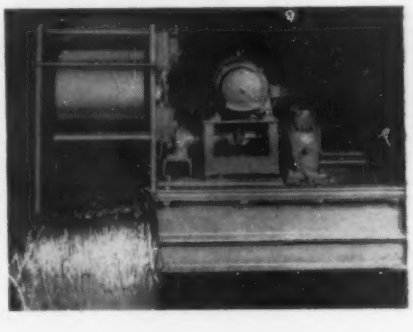
A new 4-high rolling mill handles narrow strip up to 8 in. wide; will roll material from 0.060 to 0.001 in. thick holding a gage tolerance of ±0.0001 in. Heavy reductions can be made per pass and the materials rolled range from soft copper to stainless steel. The close tolerance rolling is made possible by use of extremely heavy housings and small diameter work rolls together with accurate back tension and rewind tension control. The rolling mill is featured as a complete package unit for one-way or reversing operation. It is entirely self-contained, with drives, winders, lubricating system. *H. J. Ruesch Machine Co.*

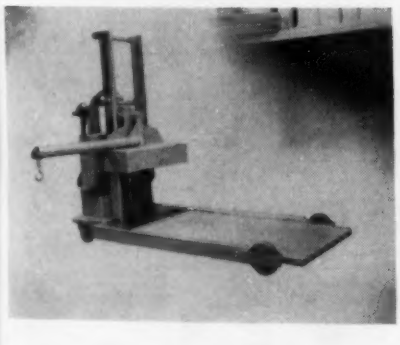
For more data circle #29 on postcard, p. 132A.

Scrap handler converts trimmings into No. 1 bundles

A compact, portable scrap baller can convert side trimmings on slitting lines into tightly packed No. 1 bundles of scrap. It can be used either as an independent unit or integrated on a slitting line. On the slitting line, the mandrel pulls side trimmings into the machine and an oscillating roller keeps the scrap ball compact until it reaches a maximum diameter of 28 in. when the machine is automatically shut off by a micro-switch. Weight of the ball varies from 200 to 700 lb depending on the type and size of the scrap and how well it winds on the mandrel. *Phillips Corp.*

For more data circle #30 on postcard, p. 132A.





Walkie truck removes tire molds from press

A JackStacker electric walkie truck with a special attachment is used to remove 2500-lb tire molds from a press and transport and stack them in storage racks. One man and one truck complete the operation. The truck is equipped with a hydraulically operated 54-in. long boom which swivels 90° either side of center. It engages the top half of the tire mold and lifts it 18 in. to clear the side of the press; swings back to center position. Top half is then lowered to the platform. Operation is repeated for lower half of mold, which remains on the hook for being transported to storage. *Lewis-Shepard Products, Inc.*

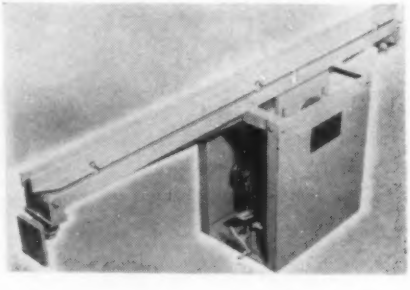
For more data circle #31 on postcard, p. 132A.

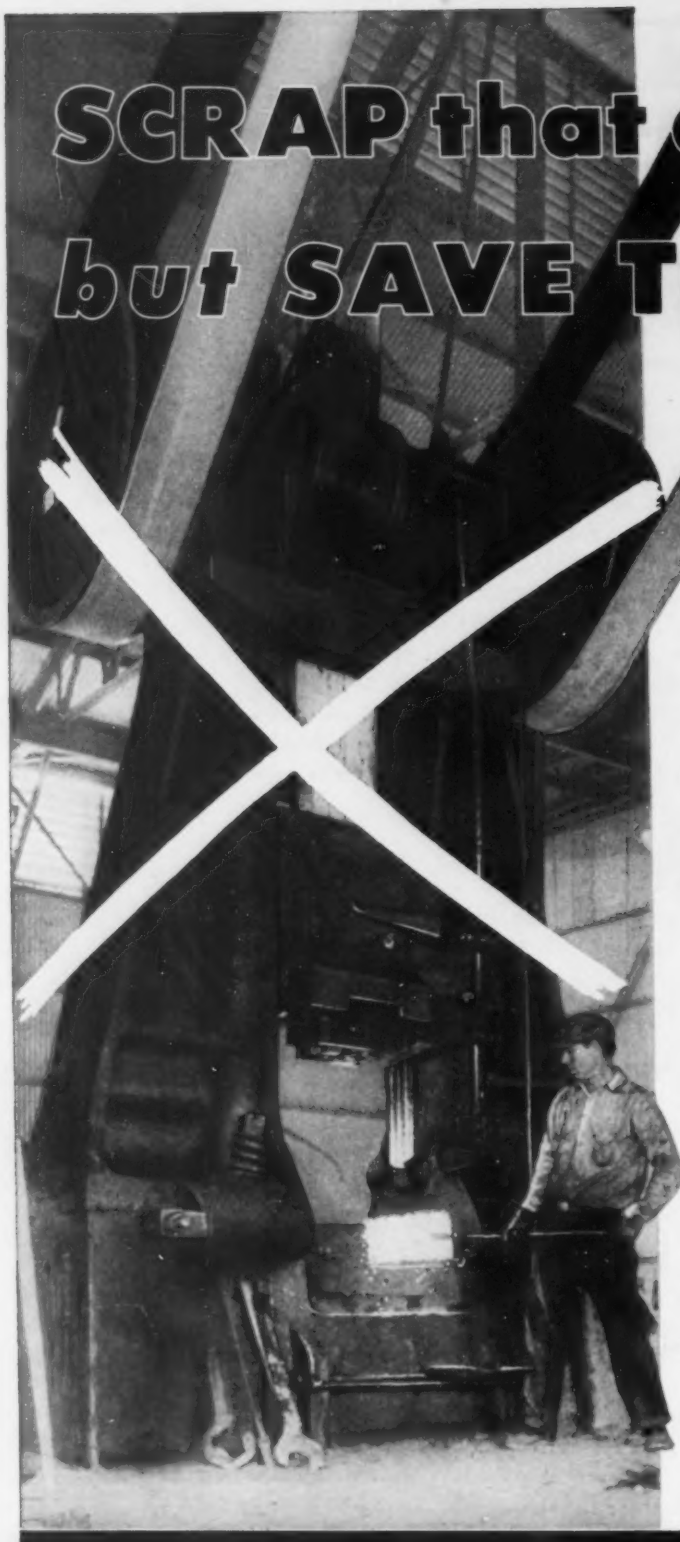
Transfer conveyor through-feeds cylindrical work

Model 1600 transfer conveyor through-feeds cylindrical work to centerless grinders, special polishing or inspection machines. The entire unit is self-contained. Drive mechanism is powered with a ¼ hp, 220/440 v, 3-phase motor. Feed rate is controlled by a variable speed drive and a range of 7 to 28 fpm is available on the standard unit. Length of standard unit is 60 in. overall. Model illustrated handles ¼ to 1½ in. diam work. *Feedall Machine & Engineering Co.*

For more data circle #32 on postcard, p. 132A.

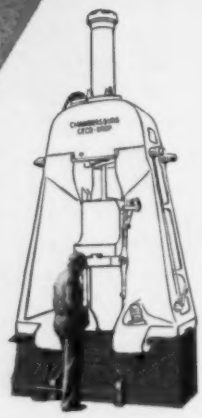
Turn Page





SCRAP that old hammer but SAVE THE ANVIL!

MOUNT A CECO-DROP UPPER-WORKS ON IT



To meet competition, your best bet is to scrap your old unproductive gravity drop hammers and install Ceco-Drops, the most modern, most productive drop hammers ever built. And for quick changeover at minimum cost, you can have Ceco-Drop upper-works fitted to your present anvil. You have all the benefits of modernization without the time and expense of replacing the anvil or disturbing the foundation.

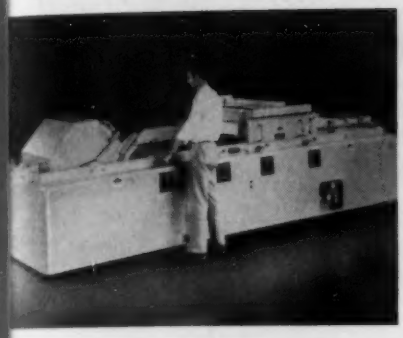
Write for Bulletin 57-L-4

CECO-DROP

Made by the BUILDERS of THE IMPACTER

CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.

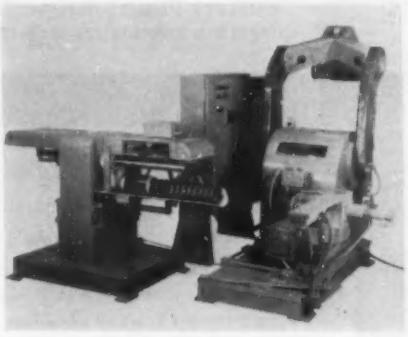
Shell molding machines for 24x36-in. patterns



The new machine incorporates two stations, and is similar in general arrangement to the 14x18-in. Shalco machine. Hydraulic power is used for rotation of the pattern and dump box at each station. There is a separate hydraulically powered shell ejection plate at each station. Curing oven is radiant heated and contains cam-actuated doors which close automatically at each end of the pattern frame during the curing cycle. Investment and curing cycles are controlled by automatic reset electric timers. Finished shells have been produced on 45-sec cycles, turning out two shells or one complete 24-36-in. mold each 1½ min. *Shallway Corp.*

For more data circle #33 on postcard, p. 132A.

Minimizes handling time between furnace and quench



A loader which receives red hot automobile springs from a coiler, rotates them into an oriented position and transfers them to a quench bath. The machine is rated at 700 springs an hour. The springs are coiled while red hot and must be transferred from the coiler to the quench bath in a minimum time to insure a proper heat treatment. They must also be oriented before they are placed in the quench. The machine accomplishes both the transfer and the orientation in 5 sec. The loader is automatically controlled and cycled so that it may be used in timed sequences with other production machinery. *Hautau Engineering Co.*

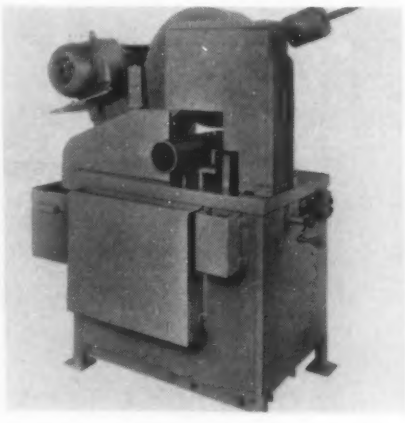
For more data circle #34 on postcard, p. 132A.

Splines broached in gears at 800 per hour

An automated broaching setup broaches the splines in two different models of a differential side gear at a total rate for both gears of 800 per hour. Gears are fed to four, side-by-side broaching stations by means of a continuous chain loading conveyor carrying 144 individual workholding fixtures mounted four abreast. Conveyor travel begins at a height convenient for manual loading and continues up at a steep angle until it reaches the broaching level where the path of the fixtures level off horizontally to accommodate the broaching and broach return strokes. A standard Colonial RU 15-48 pull-up broaching machine was adapted to this operation. A gravity-type system of unloading allows the operator to make a continuous check of individual broach operation. The two gears being broached have different hub depths, diameters and spline sizes. *Colonial Broach Co.*

For more data circle #35 on postcard, p. 132A.

Abrasive cutting at 3 sec per sq in.



Available in stationary and portable types, a dry abrasive cutting machine is capable of a speed of approximately 3 sec per sq in. of material being cut. The machine handles material up to 4 in. square at 90° to axis for solid steel, 8 in. x 90° to axis for channels. These specifications are based on using an 18-in. diam cutting wheel with a 10 hp motor, work size cutting capacity being reduced when a smaller diameter cutting wheel and less horsepower are used. The wheel is lowered into the work by a hand lever. Since the Sever-All is an oscillating type machine, the amount of abrasive wheel contact is reduced and cutting is done with a minimum of pressure on the abrasive wheel. This assures longer wheel life and cleaner cuts with a minimum of burr. *American Chain & Cable Co., Inc.*

For more data circle #36 on postcard, p. 132A.

Turn Page

YESTERDAY TODAY TOMORROW

CONTINENTAL

Serves Industry Everywhere

COMPLETE PLANTS designed, constructed, and equipped as an integrated unit for efficient and economical production.

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SPECIAL EQUIPMENT industrial furnaces, ovens, gas generators, and dryers—all fuels—field or shop erected.

PRODUCTION LINES tailored to individual needs requiring minimum labor for maximum output.

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30 Years' Extensive Experience

insures prompt service in planning and production by experienced engineers who know industry's problems. Our numerous sales and service centers keep in constant touch throughout all phases of the work.

Write for Booklet No. 135

This booklet covers the scope of CONTINENTAL Service. It is well illustrated with views of CONTINENTAL installations with descriptions of the equipment and the processes performed.

5242

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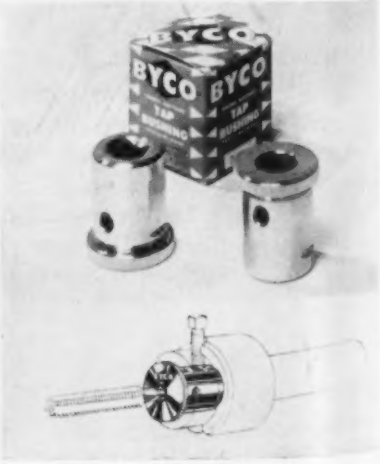
Hydraulic duplicator

The Goodrich hydraulic duplicator is reported to have doubled standard machine output. Attached to any current or old-model miller, lathe, shaper or grinder, it slashes labor costs and multiplies production efficiency on contour and die-making jobs. The unit is powered by a motor which attaches to the machine's side and delivers hydraulic pressure for automatic duplication of the most intricate master patterns or templates. It makes precision reproduction simple, fast and inexpensive. *Automotive Service Tools, Inc.*

For more data circle #37 on postcard, p. 132A.

Tap bushing

The Byco tap bushing has a square broached hole to fit and drive all standard diameter taps from No. 0 to 1⅝ in. and pipe taps from ⅛ to

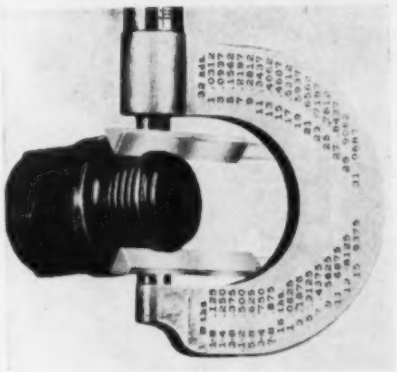


1 in. Five OD sizes fit ½, ⅝, 1, 1¼ and 1½ in. tap holders. The bushing is chrome hardened, precision made; cuts tap breakage to a minimum; and assures a better cut thread, it is stated. Tightening the self-centering screws provided on each side locks the tap securely, assures true positioning. *Byco Industries.*

For more data circle #38 on postcard, p. 132A.

Thread measuring tool

Improved thread measuring tool for machinists eliminates calculating and is used for all threads, standard or non-standard. Thread triangle gages are two hardened



and ground triangular shaped bars. They are set over and under the threaded part and a micrometer reading taken over the triangles. This reading is checked against the sum of the nominal OD of the thread and the chart factor. *Montgomery Tool Sales.*

For more data circle #39 on postcard, p. 132A.

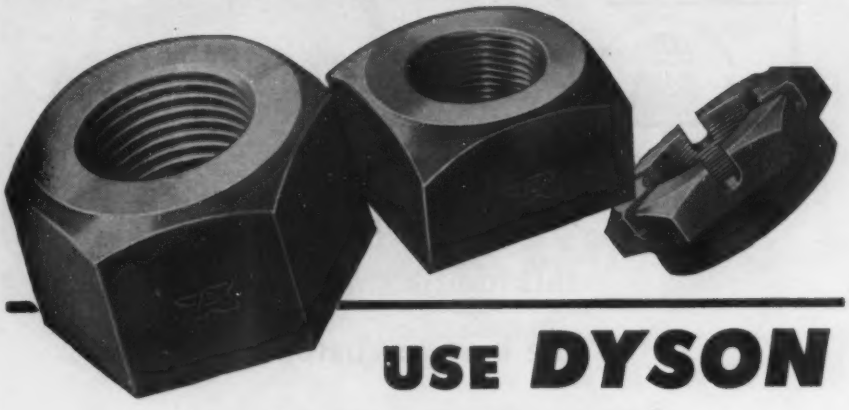
Cutting tips and torches

A complete line of cutting tips, cutting and heating torches, heating heads and other flame cutting accessories are being manufactured under the trade name of Proxy. Torch tips are designed for use with propane, butane and natural gas. Smooth clean cuts with sharp top and bottom edges, and cut surfaces having low Brinell readings are reportedly obtained at the same gas and oxygen pressures and at the same cutting speeds as when acetylene is used. *Flame Cutting Equipment Co.*

For more data circle #40 on postcard, p. 132A.

Turn Page

FOR YOUR **LARGE** FASTENERS



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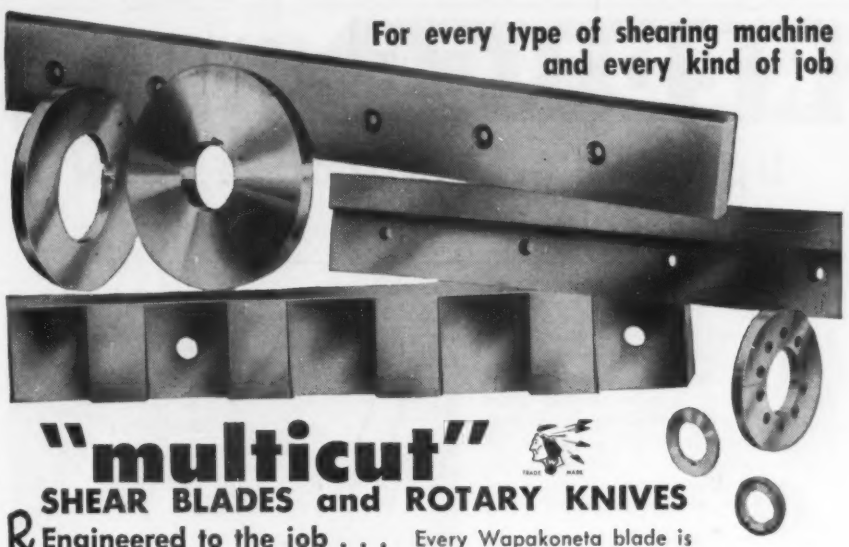

"multicut"

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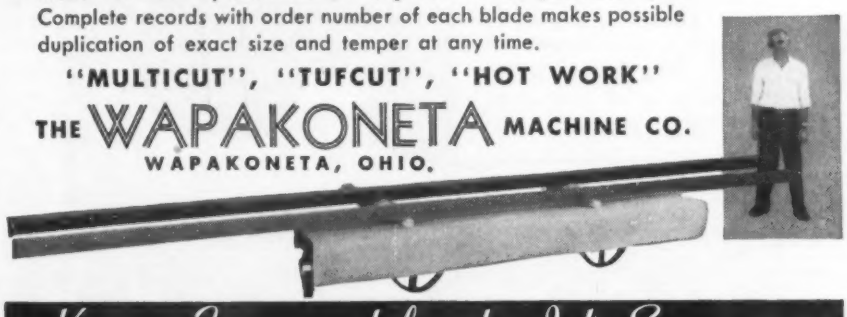

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Here's the newest idea in gas service! Leave a full gas trailer with your customer . . . replace it with another when empty. Reduces cylinder handling up to 50% . . . cuts cylinder costs . . . gives customers the convenience of having uninterrupted gas supply.

Many gas manufacturers and haulers of compressed gas (including many government agencies), are already enjoying the many advantages of INDEPENDENT Gas Supply Trailers.

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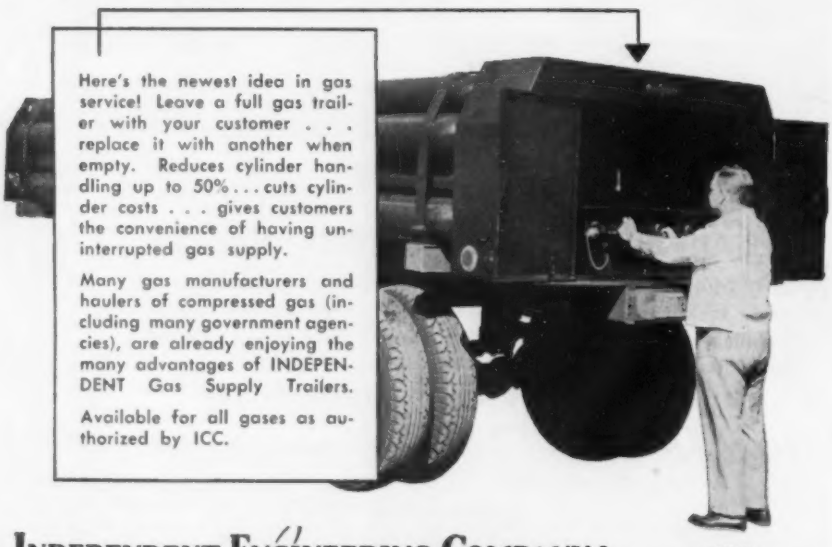

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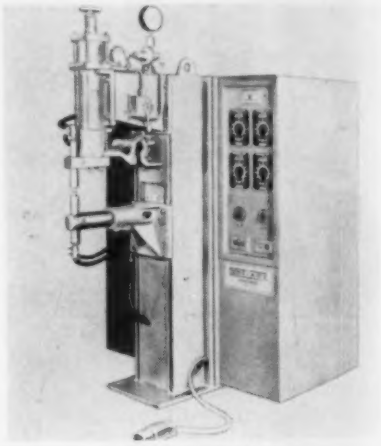
We Invite Your Inquiries

Spot, projection welders

Announcement has been made of a new design of a standard, air-operated, press type Sciaky spot and projection welder. Both the SPT 1 and EPT 1 machines are of a series of three-phase spot and projection welders available in 40, 50 and 75 kva at 50 pct duty cycle. The SPT 1 can be supplied from 18 to 42 in. throat depth with an electrode force of 1000 to 1575 lb (80 psi) dependent on throat depth; 12 to 30 in. throat depth for the EPT 1. With the SPT 1 high quality welds on large production runs on a wide range of clean mild



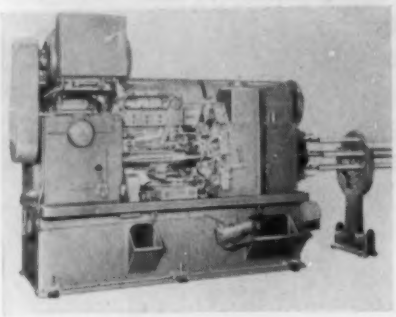
steel, stainless steel, aluminum and other light alloys can be made to commercial standards. By varying weld time, weld current and electrode force, even heavier gages can be joined at slower speeds. *Sciaky Bros., Inc.*

For more data circle #41 on postcard, p. 132A.

Six-spindle bar machine

The eleventh member of a group of six-spindle Conomatic bar machines is the 1⅝ in. Model TF, sixth of the line designed to minimize set-up and job change, particularly in the field of progressive runs where changeover costs are proportionately high. General improvements that contribute to the low-cost usefulness of the machine as a whole include: stronger machine frame, with more powerful motor drive; larger diameter transmission shafts and bearings; large diameter work spindle carrier; larger diameter main end slide with 3¼ in. work center clearance for ample swing

of tool heads of special work design; a two-train—fast and slow—spindle speed range to provide 31 speeds from 128 through 2502 rpm; dial adjustment of working strokes of the slides, and opposed tool spindles, without change of total stroke



or interference with positive stop settings, and with minimum change of master cams; simplified, adjustable, standard mechanical 6-in. maximum length stockfeed. *Cone Automatic Machine Co., Inc.*

For more data circle #42 on postcard, p. 132A.

Basket-sling combination

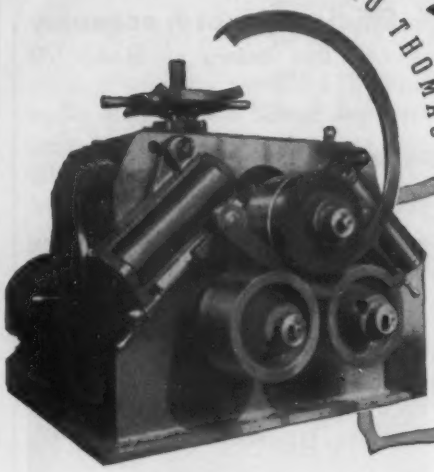
A stainless steel basket and sling combination has been produced to carry metal parts into a Lindberg Cyclone annealing furnace operating at temperatures up to 1380°F. Four baskets are nested

in the sling, and a self-locking lift bar holds them securely in place. Baskets are 22 in. OD x 6½ in. deep and are constructed of wire mesh reinforced with ½-in. diam rod. Sling is ¾-in. diam rod and is equipped with lifting hooks and standing lugs. It unfolds to allow minimum lifting of baskets. *Wiretex Mfg. Co.*

For more data circle #43 on postcard, p. 132A.
Turn Page

THE TREND IS TO THOMAS

For ANGLE-BENDING



IT'S A "MUST" FOR PRODUCTION BENDING

IF your production calls for circles or segments from angles, flats, rounds or other shapes in quantities, the THOMAS ANGLE BENDER may be the solution to *your* need for *greater production at less cost!*

BULLETIN 314
describes the four sizes and is yours for the asking. Write for it now!

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PITTSBURGH 23, PA.

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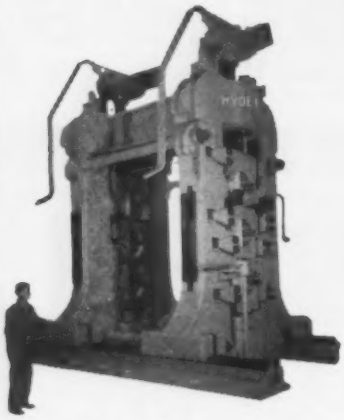

Bar Mills
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Machine Work

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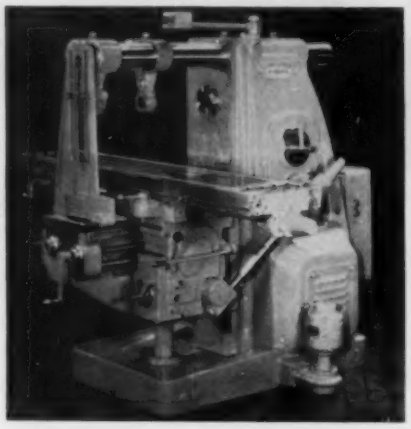
Efficiency, ease, economy

A new line known as Model CE milling machines combine quality with low initial cost. Ample range and horsepower combine with simplicity and a precision usually found in higher priced machines.

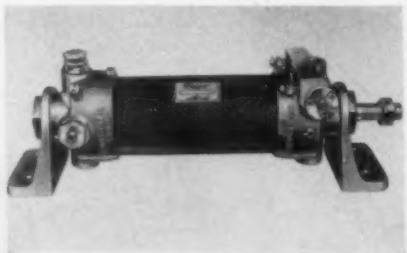


Both plain and universal styles are offered. Available in 3 hp No. 2 or 7½ hp No. 3 sizes, both feature 16 quick-change speeds from 25 to 1300 rpm and feeds of ½ to 25 rpm. The CE is suited for a wide variety of applications, especially for small tool shops, repair and maintenance shops. *Kearney & Trecker Corp.*

For more data circle #44 on postcard, p. 132A.

Air-hydraulic cylinder

Smoothness and precise control of hydraulic power from any shop air supply is provided by a new air-hydraulic cylinder. The air cylinder surrounds the oil cylinder in the new co-axial unit, avoiding the excessive length encountered with



in-line types. Automatic models are available with built-in controls of speed, direction, adjustable fast traverse either direction, and automatic recycling. Unit develops hydraulic piston thrust of 3.14 x airline pressure and pull of 2.7 x airline pressure. Any length stroke to 72-in. is available. *Modernair Corp.*

For more data circle #45 on postcard, p. 132A.

Large or small INDUSTRIAL CUT GEARS

- FURNISHED COMPLETE
- CUSTOM CUT FROM YOUR BLANKS
- HEAT-TREATED, CASE OR FLAME-HARDENED

SIMONDS GEAR produces a complete line of industrial cut gears in a full range of sizes from cast or forged steel, gray iron, bronze, Meehanite, rawhide or bakelite. Also heat-treated, case or flame-hardened carbon or alloy steel. Or, you may have your own gear blanks custom cut to your order. Same quality . . . same prompt service. Send us your requirements for quotation.

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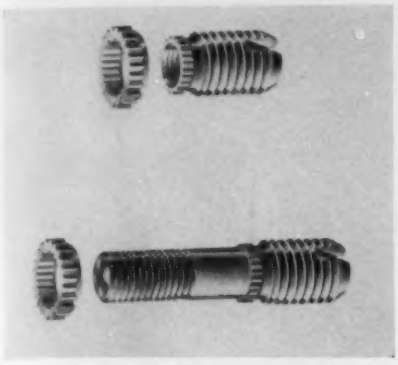
LIBERTY at 25TH. PITTSBURGH 22, PA.
Quality Gears for over 60 years

Self-tapping feature

Rosan ring-locked inserts and studs are available with a self-tapping thread. The design is said to prevent collapse of the insert's tapping segments during installation and resultant damage to the threads of



mating bolts. All threads are American National Form making emergency replacement possible with standard threaded parts of the same size and pitch. Inserts and studs are made of highest quality aircraft quality steel, are designed for maximum torque and pull-out resistance. *Rosan Inc.*

For more data circle #46 on postcard, p. 132A.

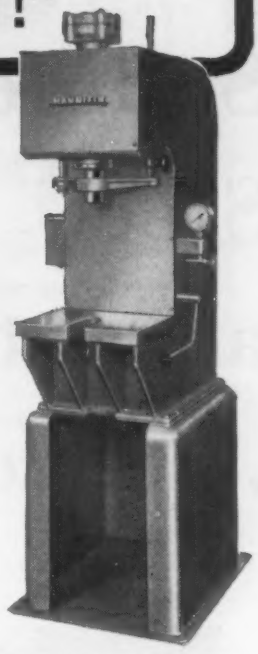
Pneumatic hammer

The Airmite air hammer weighs 3½ lb without a tool, is 7 in. long, and fits the hand like a pistol. It has a convenient fire-arm type trigger. A recessed air control screw in the handle is turned to adjust

air flow. Recoil has been eliminated by the fast reciprocation of the plunger. Hammer will not operate unless tool is pressed against the work. Blows are 3000 per min at 40 lb air pressure. *Dotmar Industries, Inc.*

For more data circle #47 on postcard, p. 132A.

"BEST $1286 WE EVER SPENT!"



That's the price of this 5-Ton HANNIFIN Press*

A lot of production men have made such comments about this versatile little hydraulic press.

They like the way you can adjust it to the exact force you need for each job, all the way from 1 ton to 5 tons. The backstroke is adjustable, too, so the ram just clears the work on any job. Fast-acting controls. Prompt delivery from stock.

WRITE. Complete information and prices on the Hannifin line of 1- to 10-ton Hydraulic Presses will be sent on request.

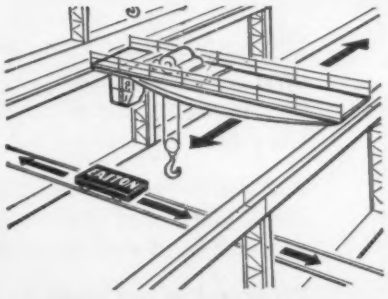
*Price complete with motor and starter F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

HANNIFIN

Hannifin Corporation, 513 S. Wolf Road, Des Plaines, Illinois

Cross-Bay Transfer

TRADE MARK



The EASTON motorized cross-bay transfer car is designed to provide lateral handling of materials to supplement overhead crane service in modern multiple bay plants. The cross-bay movement of the automatic transfer car provides a universal handling system able to spot a load anywhere on the floor of the plant. The same car system may also be used for moving materials between plant buildings.

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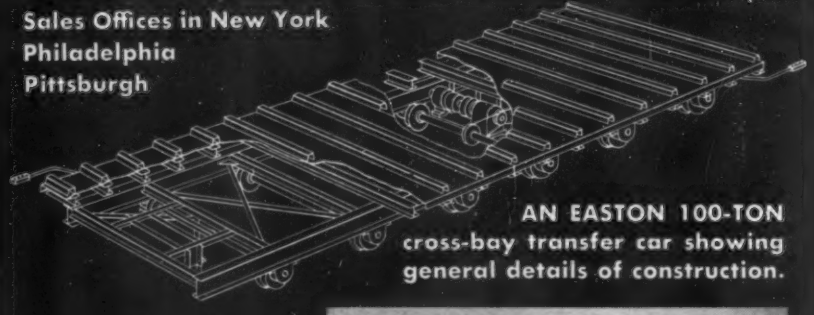
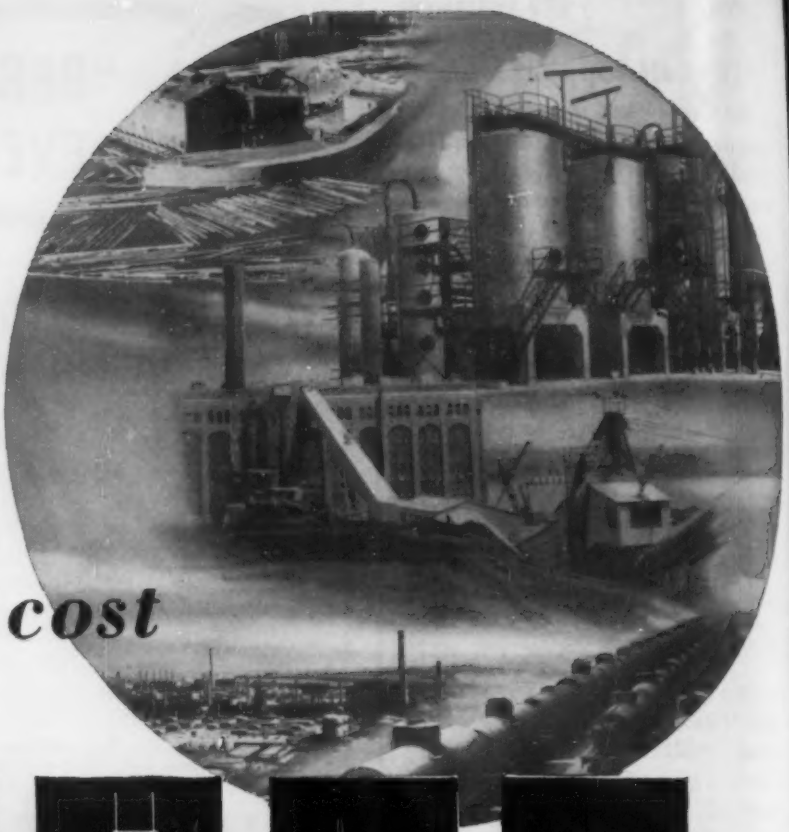


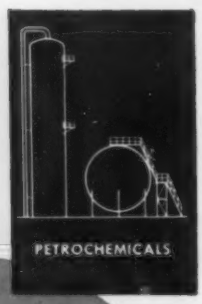
AN EASTON 100-TON cross-bay transfer car showing general details of construction.

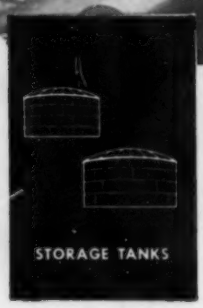
EASTON®

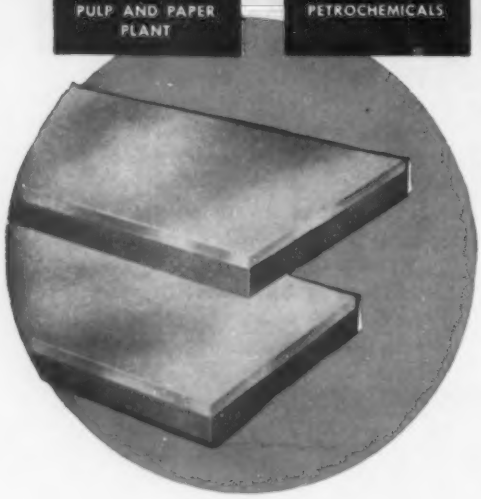
A-1046

how to get Stainless Steel advantages ...at lower cost









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The Iron Age SUMMARY . . .

Steel output may have hit year's high point . . . Operating rate holds at 82 pct . . . Nickel boost ups price of some stainless and alloy steels.

Production . . . Steel production may have reached the high for the year this week and last. Operations this week are scheduled at 82.0 pct of rated capacity, the same as last week.

This is the first week since Labor Day that an increase in steelmaking operations has not been scheduled. Since Labor Day production has increased more than 30 pct.

Production is expected to dip during the holidays. But the seasonal decline will be less than usual because of the strong upsurge in demand.

District Rates . . . With some exceptions, greatest market strength is in the Great Lakes area. This is confirmed by the following IRON AGE district operating rates for this week:

Buffalo, 100 pct of capacity; Detroit, 92; Cleveland, 90.5; Wheeling, 88; Chicago, 87.5; West, 85; South Ohio River, 81; Youngstown and St. Louis, 79; Pittsburgh, 78; Philadelphia, 71; Birmingham, 67; and Northeast, 65.5 pct.

Demand . . . Almost all steel buyers contacted by THE IRON AGE indicate they are placing orders for more tonnage than they have in months. Although some products can still be had on almost immediate delivery, the trend is toward bigger order backlogs and more extended delivery.

In the torrid galvanized sheet market some orders have been booked into the warm months of 1955. A number of mills are sold out through the first quarter on cold-rolled sheets. And some mills report delivery time on hot-rolled sheets has doubled within the past several weeks. Carbon bars, both hot-rolled and cold-finished, are picking up. So is manufacturers wire. Stainless and alloy steels are also stronger.

Demand for oil country goods is weaker, but is expected back strongly in first quarter. Merchant wire is seasonally weak. Despite high level of construction, structurals are softer, partly because of dearth of freight car orders. Rails and accessories are dead.

Prices . . . Stainless and alloy steel producers have raised prices of nickel-bearing grades as a result of the recent 4½¢ per lb increase in the price of nickel. Stainless steel base price increases average about 2 pct for grades affected. Alloy steel price advances, in the form of grade extras, average about 1 pct.

The price boosts were expected, and were surprisingly modest—particularly for stainless, where the price line had been held since June of 1953 despite higher wage and material costs.

Steel Output, Operating Rates

	This Week†	Last Week	Month Ago	Year Ago
Production (Net tons, 000 omitted)	1,944	1,958	1,892	1,900
Ingot Index (1947—49=100)	121.0	121.9	117.8	118.3
Operating Rates				
Chicago	87.5	89.5	85.0	93.5
Pittsburgh	78.0	77.0	75.0	91.0
Philadelphia	71.0	71.0	70.0	89.0
Valley	79.0	79.0	78.0	77.0
West	85.0	87.0*	81.5	89.0
Detroit	92.0	88.0*	88.0	81.0
Buffalo	100.0	100.0	97.5	87.5
Cleveland	90.5	90.0*	80.0	78.0
Birmingham	67.0	66.5	63.5	96.5
S. Ohio River	81.0	78.0	85.0	81.0
Wheeling	88.0	100.0*	97.0	88.0
St. Louis	79.0	80.0	84.0	88.0
Northeast	65.5	78.0	68.0	66.5
Aggregate	82.0	82.0	79.5	85.5

*Revised. †Tentative

Prices At A Glance

(cents per lb unless otherwise noted)

	This Week	Week Ago	Month Ago	Year Ago
Composite prices				
Finished Steel, base	4.797	4.797	4.797	4.634
Pig Iron (gross ton)	$56.59	$56.59	$56.59	$56.59
Scrap, No. 1 hvy (gross ton)	$32.00	$32.17	$33.83	$30.67
Nonferrous				
Aluminum, ingot	22.20	22.20	22.20	21.50
Copper, electrolytic	30.00	30.00	30.00	29.75
Lead, St. Louis	14.80	14.80	14.80	13.30
Magnesium, ingot	27.75	27.75	27.75	27.00
Nickel, electrolytic	67.67	67.67	63.08	63.08
Tin, Straits, N. Y.	89.50	89.875	91.50	86.00
Zinc, E. St. Louis	11.50	11.50	11.50	10.00

Stainless, Alloy Prices Rise

The 4½¢ per lb nickel increase forced producers to boost nickel-bearing grades . . . Price jumped about 2 pct on most stainless grades, alloy up 1 pct in extras.

◆ STAINLESS and alloy producers were forced to increase prices of nickel-bearing grades due to the 4½¢-per-lb advance in price of nickel. The stainless increases averaged about 2 pct for the grades affected, while the alloy advances, in the form of grade extra revisions, amounted to about 1 pct.

The price boosts were expected, and were surprisingly modest; particularly for stainless, where the price line was held since 1953 despite higher wage and material costs preceding the nickel price boost. (THE IRON AGE, Dec. 2, 1954, p. 68.)

Stainless increases ranged from ½¢ to 2¢ per lb, depending on nickel content. Straight chrome prices held unchanged. Grade extra changes on alloy applied only to those grades containing over 0.70 pct nickel.

Strong competitive conditions within the industry and with flat-rolled aluminum products had prompted stainless producers to hold the price line until the nickel price advance, which was too much to absorb. Improvement in the market also encouraged producers.

Meanwhile, the situation in other products continues to improve or hold steady. Cold-rolled sheets are well into first quarter, while hot-rolled sheets, strip, bars, silicon sheets, galvanizing sheets, enameling iron are continuing to improve. Oil country goods are suffering from inventory reductions; tinplate is in a seasonal slump; merchant pipe is steady and fair; merchant wire and construction products off seasonally, but manufacturers wire is strong; there has been a slight pickup in mechanical and pressure tubing; wide-flanged beams are in fair demand but structurals and plate are soft.

SHEETS AND STRIP . . . The bulge in cold-rolled sheets has stretched to the East, where one producer reports deliveries extended to 8-9 weeks. Elsewhere, the market has backed up into February and March. In **Chicago** cold-rolled sheet has been sold out 100 pct for first quarter. Hot-rolled sheet demand is moving up steadily; in **Chicago,** producers are quoting five-week delivery. Demand is catching up with cold-rolled strip producers. The market is strong in all major producing centers.

GALVANIZED . . . May be the strongest market item although the picture varies. In **Detroit,** buyers find mills booked through April. In the **East,** one mill is taking July orders on continuous, and hot-dip deliveries are extended 18-20 weeks. Other mills in the same area are quoting March-April delivery on continuous. **Chicago** is sold out on continuous through first quarter and buyers are waiting in line to get on the books for second quarter.

ELECTRICAL SHEETS . . . Fractional horsepower motor business has strengthened market as appliance producers step up production schedules. Transformer business is suffering from an inventory problem but producers look for a pickup in this market early next year.

STAINLESS . . . Stainless producers have boosted prices of nickel-bearing grades an average of 2 pct on the heels of the 4½¢-per-lb increase in nickel. The nickel price advance, coupled with a market that has improved steadily in the last six weeks, brought about the increase. Producers report improved demand from virtually all consumers.

LONG TERNES AND ENAMELING SHEETS . . . Bolstered by demand from automotive, air conditioning and heating, the long terne market is strong. Improvement in demand from appliance manufacturers has spurred enameling sheet producers to capacity operations.

BARS . . . Both alloy and carbon bar demand improving steadily. In **Detroit** the market continues soft although cold-finishers are asking more time for deliveries due to apparent tightening in hot-rolled, their raw material. Cold-finished market in **Chicago** is up approximately 20 pct in the last month. **Cleveland** finds alloy and carbon running a 3-4 week backlog. In the **East** and **Pittsburgh,** carbon and alloy are gaining more strength.

STRUCTURALS . . . The wide-flange market is good. But standard sections are lagging despite continued high construction levels in some sections of the country. Poor demand from the railroads is an important factor in standard structural lethargy. A major fabricator reports that his overall 1954 business in the **East** will be off only slightly from 1953 and considers outlook for first half of 1954 as good.

PLATES . . . Market is weak at present, but pending pipeline projects are expected to strengthen demand beginning about February. A pickup in freight car construction and shipbuilding could make plates a strong item next year.

PIPE AND TUBING . . . Inventory reductions in the oil fields have cut into oil country goods backlogs. At least one mill is producing in anticipation of pickup in first quarter. Mechanical and pressure tubing sales are up 20 pct for November in the **East,** and a slight improvement is noted in **Pittsburgh.** Standard pipe demand holding up well due to high level of construction, and in the **East** business was up 2-3 pct in November.

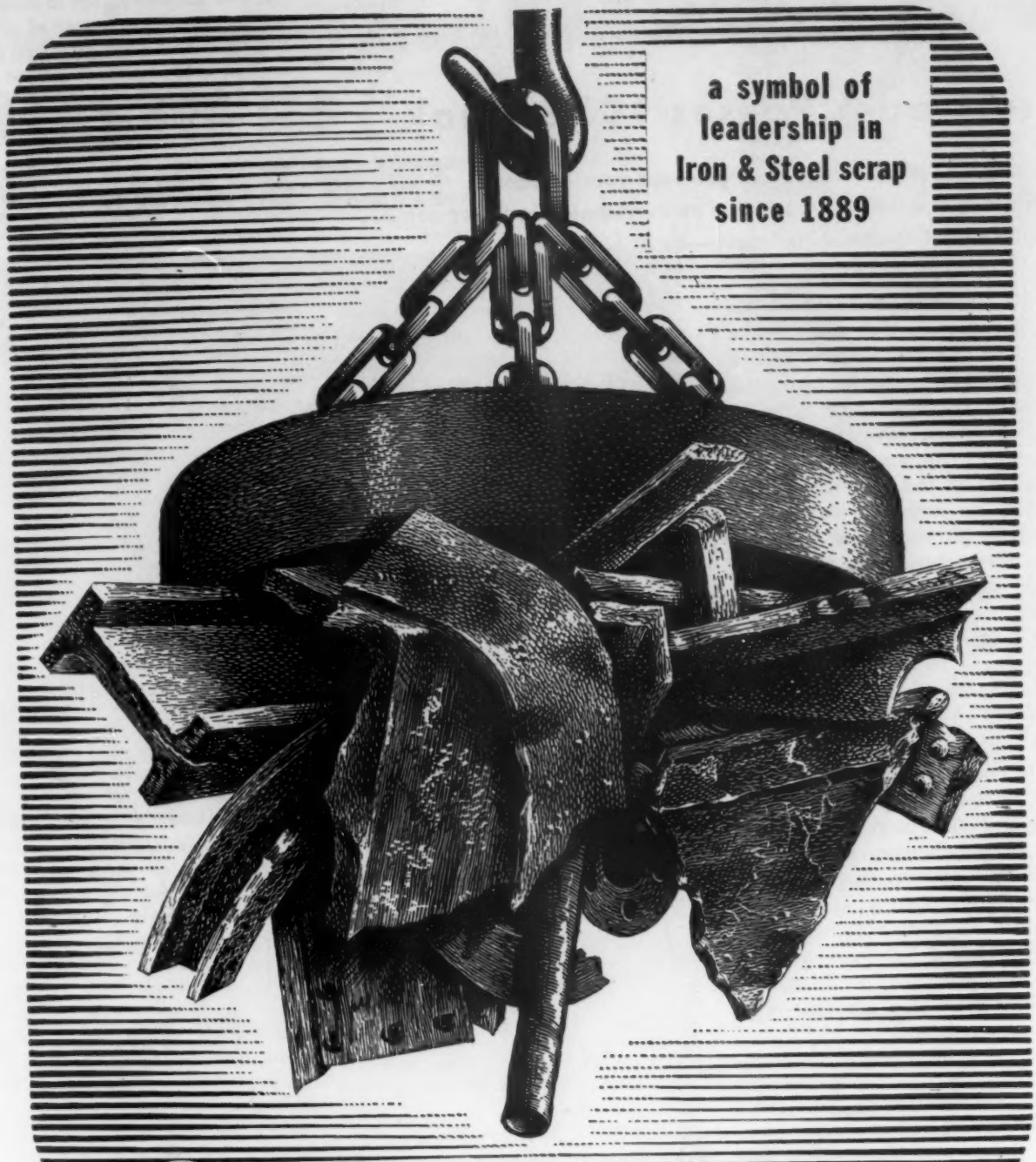
Purchasing Agent's Checklist

HIGHWAYS: See coming boom in construction equipment . . . . p. 71

FREIGHT: Combining deliveries allows up to 15 pct savings . . p. 75

STEEL FLOORING: Market is growing with building boom . . . . . p. 74

MANGANESE: Supply situation has eased considerably . . . . . p. 80



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Aluminum Passes 1953 Peak

Primary output has topped the previous yearly record with another month to go . . . See no curtailment in December . . . Aluminum mill shipments increase—By R. L. Hatschek.

◆ PRODUCTION of light metals is a major topic this week as the aluminum industry swings through the last month of the year with the previous all-time yearly production record already surpassed in November. Output for the first 11 months of the year was 1,333,-531 tons as compared to the 1953 record for 12 months of 1,252,015 tons. Encountering no significant power difficulties, the industry should turn out approximately 125,000 tons in the current month which ought to bring the total to over 1,458,000 tons.

But the situation in magnesium is pretty much the reverse. Not only is production lower this year —and slipping—but with only a month and a half to go on Velasco's twice extended lease, there's still no definite answer on what will happen to the plant at the end of next month. Trying to ward off the blow that a Velasco shutdown would be, the Magnesium Assn. has adopted a resolution favoring continued production there.

ALUMINUM . . . November score of the aluminum industry was 121,-252 net tons of primary metal produced. This is a slight dip from the previous month's 125,089-ton total but on a daily average basis it actually tops October. This brings the total for 11 months of 1954 to 1,333,-531 tons and, with output continuing unabated, virtually assures a 1954 total of 1,458,000 tons.

Mill product shipments for October were generally better than the preceeding month. Exceptions to the rising trend were heat-treatable sheet and plate, hard alloy drawn tubing, rolled rod and bar, and ACSR and cable.

Hottest item continues to be foil which established another new monthly shipment record at 7405 tons. This is the seventh monthly record set by foil in the 10 months so far tabulated in 1954.

Following are October aluminum mill product shipments compared with September totals. Figures for all products are in net tons:

	Oct.	Sept.
Sheet & Plate, total	44,470	43,563
Non-Heat-Treatable	35,806	34,520
Heat-Treatable	8,664	9,043
Foil	7,405	6,650
Extruded products, total	12,930	11,313
Soft Alloys	10,856	9,343
Hard Alloys	2,074	1,971
Tube, Drawn, total	1,995	1857
Soft Alloys	1,810	1,560
Hard Alloys	185	297
Rod & Bar, Rolled	5,735	6,703
ACSR & Cable, Bare	3,479	4,876
Wire, Other than Conductor	1,786	1,668
Forgings	1,914	1,724
Castings, total	11,864	10,356
Sand	885	788
Permanent Mold	5,634	4,895
Die	5,344	4,673

MAGNESIUM . . . With only a month and a half to go before the cutoff date and still no plans announced by Washington, the Magnesium Assn. has formally gone on record as favoring the continued operation of the Velasco, Tex., facility "upon any reasonable basis which will assure continued ample supplies of magnesium in all forms." (For detailed news article on Velasco see THE IRON AGE, Dec. 9, p. 100)

ZINC . . . Smelter stocks of slab zinc took another plunge in November —sixth consecutive month of decline. The 17,479-ton drop brought stocks down to 134,658 tons, the lowest since last August and 35 pct beneath the May peak of 209,828 tons.

Shipments totaling 97,958 tons, heaviest since October 1947, were the main factor in the stock reduction. Broken down, shipment figures were: Domestic, 79,583 tons, highest since November 1952; export and drawback, 2449 tons, tops since February; and government account, 15,566 tons, most since August.

Production-wise November was the best month in just over a year with smelter output of 80,119 tons of slab zinc, though in the light of still standing stocks this may not be considered a good thing. Unfilled orders at the end of the month were 44,042 tons, somewhat below the last 2 months but far better than the first 8 months of 1954.

Market conditions remain healthy with demand continuing at a good level. And General Services Administration finally sent out requests for December stockpile metal late last week.

LEAD . . . GSA also came into the market for December stockpiling of lead at the end of last week. As with zinc, offers from producers were due back in Washington this Tuesday. Same pattern as earlier stockpiling was followed and it's expected that buying will again be around the 10,000 ton level.

American Bureau of Metal Statistics reports that smelter and refiner stocks of lead in ore and matte, base bullion, refined and antimonial totaled 203,889 tons as of the beginning of November. This is a decline of some 5150 tons from the previous month.

COPPER . . . With consumers still virtually beating the bush for copper, the market is still definitely tight and is expected to stay that way for at least a while. Business and Defense Services Administration has cut off the supply of government metal at least for January.

Some 7600 tons of government copper were available in December, which brought the total since strike's end to nearly 41,000 tons. It is considered extremely doubtful that any further metal will be available from this source. Producers, meanwhile, have indicated to their customers that availability next month will be about the same as it has been during the current month.

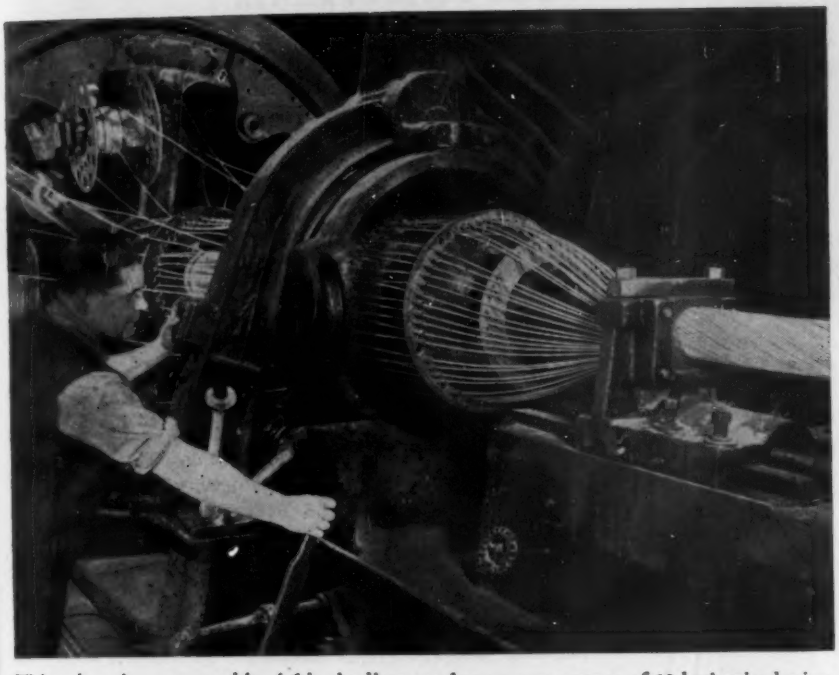
Daily Nonferrous Metal Prices

(Cents per lb except as noted)

	Dec. 8	Dec. 9	Dec. 10	Dec. 11	Dec. 13	Dec. 14
Copper, electro, Conn.	30.00	30.00	30.00	30.00	30.00	30.00
Copper, Lake, delivered	30.00	30.00	30.00	30.00	30.00	30.00
Tin, Straits, New York	90.00	90.00	89.875	....	89.50	89.50*
Zinc, East St. Louis	11.50	11.50	11.50	11.50	11.50	11.50
Lead, St. Louis	14.80	14.80	14.80	14.80	14.80	14.80

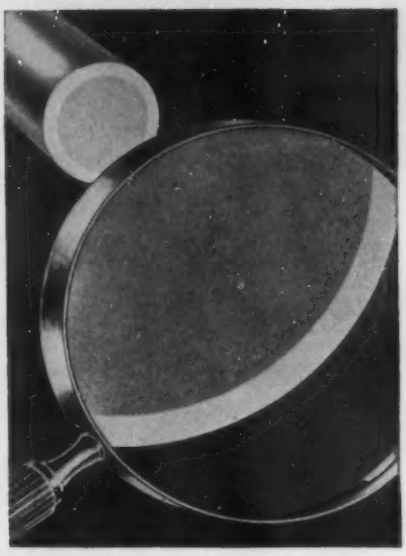
Note: Quotations are going prices **Tentative*

The zinc won't crack or peel when it's BETHANIZED WIRE



This submarine power cable, 4.6 in. in diameter, has an outer armor of 52 bethanized wires. Designed to transmit 27,000 hp, the 7½-mile cable is laid across the bottom of Puget Sound. It was built by The Okonite Co., Passaic, N. J., for the Bonneville Power Administration.

Bethanized wire takes a constant dousing from hot-steam and cold-water sprays as it keeps cut corn on the move in this food-freezing plant. This conveyor belt, made by The Cambridge Wire Cloth Co., Cambridge, Md., has given excellent service due to its sound construction and the long-lasting bethanized coating.



The uniform coating of pure, ductile zinc is locked on the steel. That's why bethanized wire is so resistant to corrosion, and can take such severe forming without damage to its protective armor.

Pure zinc, perfectly bonded to steel—that's bethanized wire. Bend it, twist it, wrap it—even draw it—and the highly-pure, ductile zinc armor stays put. You can depend on bethanized wire, even though the job calls for severe forming, weaving or wrapping.

New users are surprised to discover how uniform the bethanized coating is, and how tightly it's bonded to the steel. That's the result of the bethanizing process, which electrolytically deposits the 99.99-pct-pure zinc, atom by atom, on the steel wire.

The tight, bright bethanized coating is adding sparkle and eye appeal, as well as improved serviceability, to hundreds of products made from zinc-coated wire. Like to have us arrange for a trial order in your plant? Just phone or write the nearest Bethlehem sales office for complete details.

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